TECHNICAL MANUAL

MUD HOG® System II, System III And System IV Powered Wheel Drive Systems

Patent No. 4-140-196

COVERING
SYSTEM OPERATION
EQUA-TRAC II VALVE OPERATION
SYSTEM TROUBLESHOOTING & TESTING
WHEEL DRIVE MAINTENANCE
WHEEL MOTOR OPERATION & SERVICE PROCEDURES

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TECHNICAL MANUAL

MUD HOG System II, System III and System IV Rear Wheel Drive

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NOTE: Information in this manual is proprietary property of Tuthill Transport Technologies.

GENERAL INFORMATION

This technical manual is intended for use by dealer service manabers, salesmen and shop mechanics to provide detailed information on components, operation characteristics and servicing of a *MUD HOG* System II, III or IV rear wheel drive. The information will be helpful for becoming acquainted with the system and its components.

Section A* of this manual covers system operation. It features the use of pictorial circuit diagrams showing what occours when the *MUD HOG* system is turned on and off.

Section B* features useful information with detailed illustrations describing the function of the internal components within the Equa-Trac II valve, which is common to all *MUD HOG* kits.

Section C* outlines problems and causes that can typically occur with the *MUD HOG* system and corrective actions (with test procedures) to perform in solving those problems.

Section D* provides information on wheel drive maintenance including procedures to disassemble and reassemble the steerable wheel drive unit for replacement of worn components. Illustrated “exploded” parts breakdowns are provided for wheel drive units.

Section E* contains information describing the operation of the wheel motor and step-by-step disassembly/assembly procedures for servicing the wheel motor. Special tools required for these procedures are listed and illustrated.

For additional information not covered in this Tuthill Drive Systems Technical Manual, contact a Tuthill Drive Systems service representative toll free 1-800-348-2474.

Pictorial illustrations and part numbers of all the individual parts in a *MUD HOG* rear wheel drive kit can be found in a *MUD HOG* Parts Catalog for a specific kit and machine application.

IMPORTANT: Cleanliness is essential when installing or servicing hydraulic components. When disconnecting hydraulic components, areas surrounding the connections should be steam cleaned or washed with solvent so that contamination will not enter the system. Always keep hoses and connectors and ports suitably capped or covered to keep contamination out of the system.

- See table of contents for details.

NOTE: ***MUD HOG*®** and Equa-Trac II® are registered trademarks of Tuthill Drive Systems.

SAFETY PROCEDURES

READ THESE PROCEDURES COMPLETELY. Make sure you fully understand all controls BEFORE operating the system.

The safety information given does not replace safety codes, insurance needs, or federal, state, and local laws.

Standard safety procedures should be observed and practiced when operating or servicing the MUD HOG system. CAUTION should be practiced at all times.

All components MUST be securely and correctly mounted and connected BEFORE operating the system.

In the event of any malfunction in the system, the MUD HOG should be shut "OFF" immediately and not restarted until the machine is correctly serviced.

When raising the rear of the machine, make sure that a dependable lift device is used of adequate capacity. Use suitable jack stands to support the machine. Apply "PARK" or "EMERGENCY BRAKE" and block the front wheels to prevent the machine from rolling.

DANGER - Escaping fluid under pressure can have sufficient force to penetrate the skin, causing serious personal injury. Fluid escaping from a small hole can be almost invisible. Use a piece of cardboard or wood rather than your hands, to search for suspected leaks. Make sure that the system pressure is relieved BEFORE disconnecting any hoses or steel line connections.

DO NOT alter axles in ANY manner -- alteration may reduce the strength resulting in possible damage or personal injury.

DO NOT alter any component of the MUD HOG system. Unauthorized modification may result in possible damage or personal injury.

DANGER - Failure to follow proper procedures when mounting a tire on a wheel or rim can produce an explosion which may result in serious bodily injury. DO NOT attempt to mount a tire unless you have the proper equipment and experience to perform the job safely.

WARNING - Any damaged high pressure hose should be replaced with a comparable four spiral wire reinforced hose. DO NOT use a two or three wire braid hose. These types of hoses are NOT designed to withstand the high operating pressures in a hydrostatic system.

SECTION A: *MUD HOG* SYSTEM OPERATION

INTRODUCTION

This system operation section provides information on:

1. Performance
2. Electrical Components and Controls
3. Hydrostatic Circuitry Description
4. Operational Circuit Diagrams
5. Adjustments and Maintenance

Since the major components provided in a *MUD HOG* rear wheel drive kit are similar for all combines and four-wheel cotton pickers, information in this section is general, it is applicable to any hydrostatic machine equipped with a *MUD HOG* rear wheel drive system. For more detailed information on system installation, replacement parts and servicing, refer to the installation-operation manual and parts catalog, available through the dealership for from Tuthill Drive Systems for the specific rear wheel drive kit.

1. PERFORMANCE

A *MUD HOG* System II, III or IV rear wheel drive (RWD) equipped machine now has more overall draw-bar pull to help get through tough field conditions, such as heavy mud or soft, sandy soil. The operator will also be able to maintain better steering control in slippery conditions or on hill sides. Even in less muddy conditions, with all four wheels pulling, the machine will roll over the field with less rutting.

The *MUD HOG* drive system is simply an extension of the machine's hydrostatic drive system. Whenever the RWD is engaged, the Equa-Trac II valve diverts some of the oil flow from the hydrostatic pump to the wheel motors in the RWD system. The oil flows to the path where resistance is the lease, until the hydrostatic pressure is balanced between the hydraulic motor near the main drive axle and the wheel motors.

The cam lobe wheel motors have a fixed displacement, so the amount of wheel torque or draw-bar pull obtained is determined only by hydrostatic pressure. As long as all four wheels maintain good traction, the pump will provide adequate flow at whatever pressure is required to maintain a desired speed.

If one or both of the front wheels start(s) to spin (loses traction), most of the oil flows to the spinning wheel(s) and pressure to the other wheels is greatly reduced. Therefore, it is important to maintain traction with the front wheels in order to obtain the most pull with the front wheels. Wheel spin-out can be stopped by shifting to the next higher gear ration to reduce the amount of torque on the front wheels or by lightly applying the brakes.

Naturally, one factor that affects front tire traction is the type and size of tire used. Because of the many variations in soil types and operating conditions that can change from day to day it is not possible to recommend one tire that will work for all conditions. Local experience is usually the best guide.

Another factor that affects wheel traction is the balance of pull between the front and rear wheels. This balance is affected by tire size and by the weight distribution between the front and rear axles.

1. PERFORMANCE continued:

It is best to use the RWD AT ALL TIMES when working in a field. The operator will gain these advantages:

1. The machine will be operating at lower pressure, thereby helping to extend the life of the main hydrostatic transmission and gear train.

2. The operator will have improved steering obtained by powering the rear (steerable) wheels.

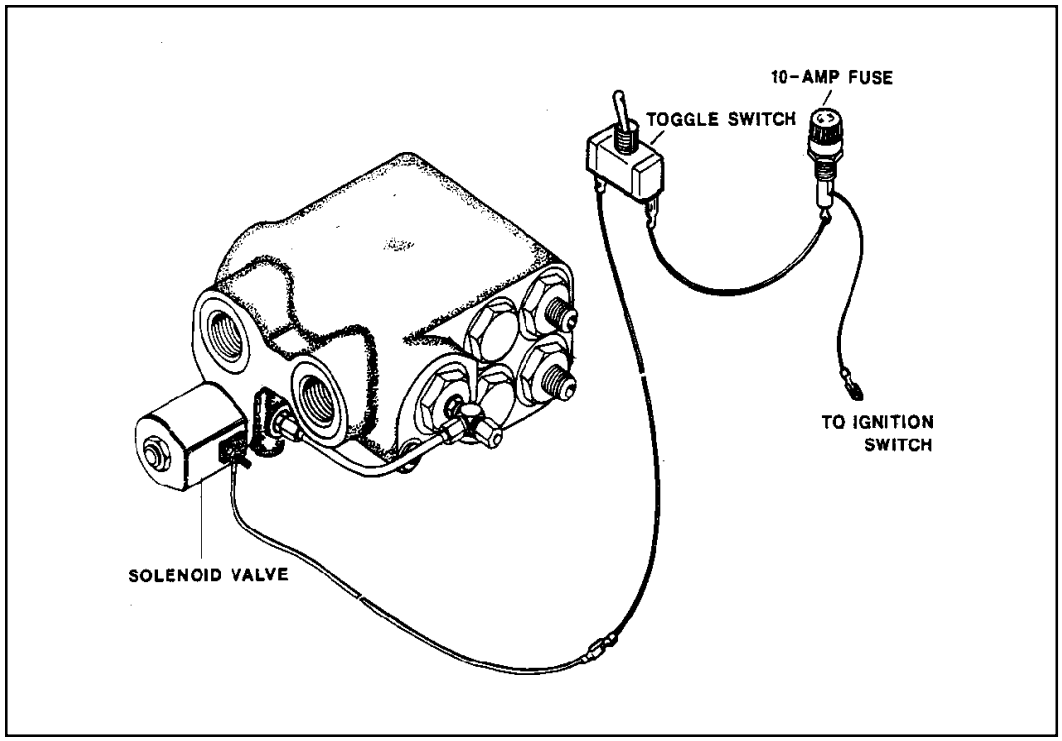
3. Finally, the temperature of the hydrostatic oil will normally be lower as a result of running the machine at lower system pressure.

Roading the Machine

For "roading" the machine, the operator can switch the RWD off to obtain higher road speeds. The cam lobe motors automatically free-wheel when the RWD is turned off. There is NO LIMIT to the distance the machine can be driven on the road at one time.

2. ELECTRICAL COMPONENTS AND CONTROLS

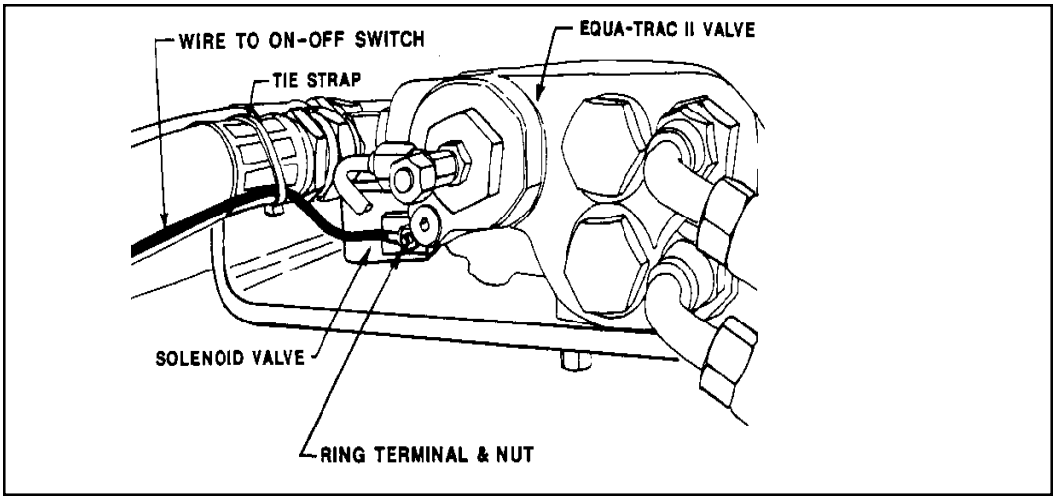
The *MUD HOG* RWD can be engaged by use of a toggle or rocker switch located in the cab. Electrical current travels from the ignition switch through a 10-amp fuse to the ON-OFF switch. When the switch is ON, current also travels to the solenoid valve at the Equa-Trac II valve. When the switch is OFF, current is NOT transferred to the solenoid valve.



2. ELECTRICAL COMPONENTS AND CONTROLS continued:

SOLENOID VALVE: The solenoid valve contains a 12 volt coil which activates a plunger within a cartridge, when energized. The valve directs charge pressure (provided by the machine's charge pump) to a spool within the Equa-Trac II valve via an internal shuttle spool (no external charge pressure hose). Passages in the cartridge are opened or closed by the movement of the plunger. When the solenoid coil is energized, charge pressure oil is directed through the open passages in the cartridge to one end of the selector spool. The charge pressure oil moves the spool toward an engaged or ON position to operate the *MUD HOG* System. When the solenoid valve coil is deenergized, the charge pressure oil moves the spool toward a disengaged or OFF position.

There is only one wire to the solenoid valve; it is routed from the ON-OFF switch in the cab and back to the solenoid. The wire is tie-strapped in several places to prevent abrasion from rubbing, which could cause a short and blow the fuse. The wire is connected to the solenoid valve by means of a ring terminal and nut.

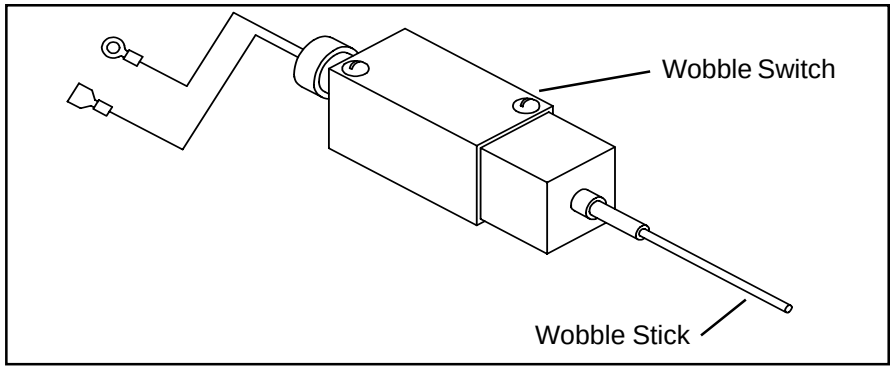


A quick check can be performed to be sure that wires are properly connected: Turn the ignition switch ON (do not start engine). Have an assistant turn the ON-OFF switch (in the cab) ON; you should hear a distinct "click", indicating the solenoid is working properly.

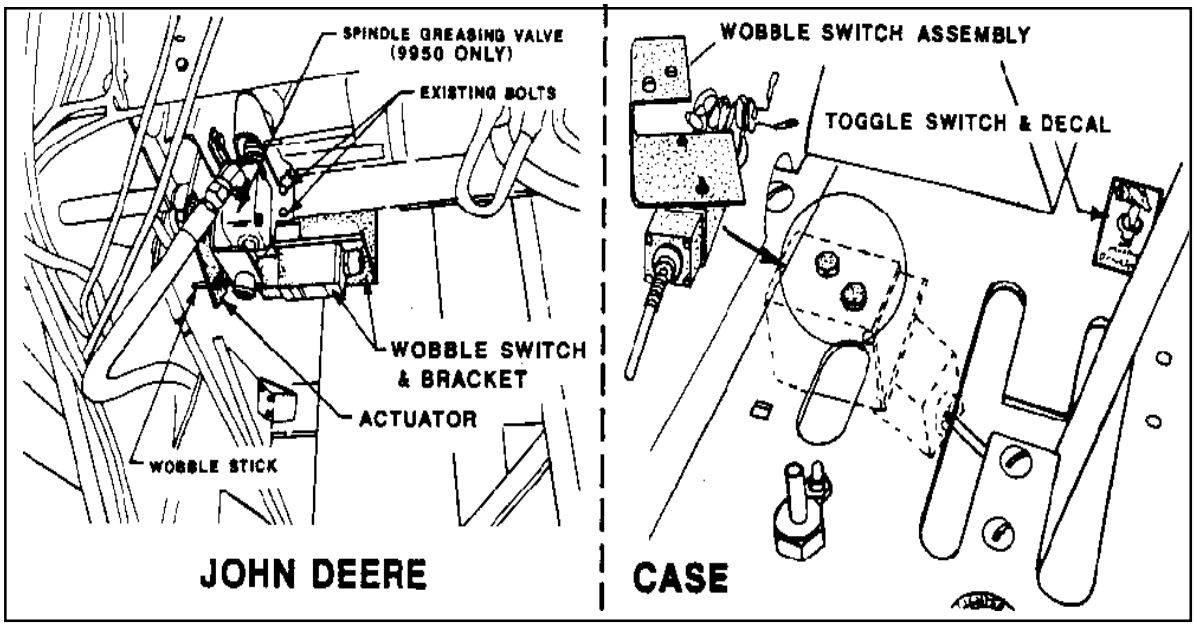
2. ELECTRICAL COMPONENTS AND CONTROLS continued:

A. Wobble Switch for Cotton Picker Applications

The primary reason why the wobble switch is used in cotton picker applications is to prevent engagement of the *MUD HOG* RWD system while the picker heads and related components are being lubricated. If the wobble switch was not installed, and the *MUD HOG* operating switch was ON (while the picker heads were being lubricated) it is possible for the *MUD HOG* RWD to develop enough torque to move the machine. This potentially dangerous situation can be prevented by the use of the wobble switch.



The wobble switch operates as a normally open switch that is engaged (closed) whenever the transmission shift lever is moved into gear, and the ON-OFF *MUD HOG* RWD switch is turned ON. The switch then allows electrical current to be supplied to the Equa-Trac II (E-T II) valve solenoid to operate the *MUD HOG* system. When the transmission is in neutral, the wobble switch is opened, thus preventing the *MUD HOG* from operating.

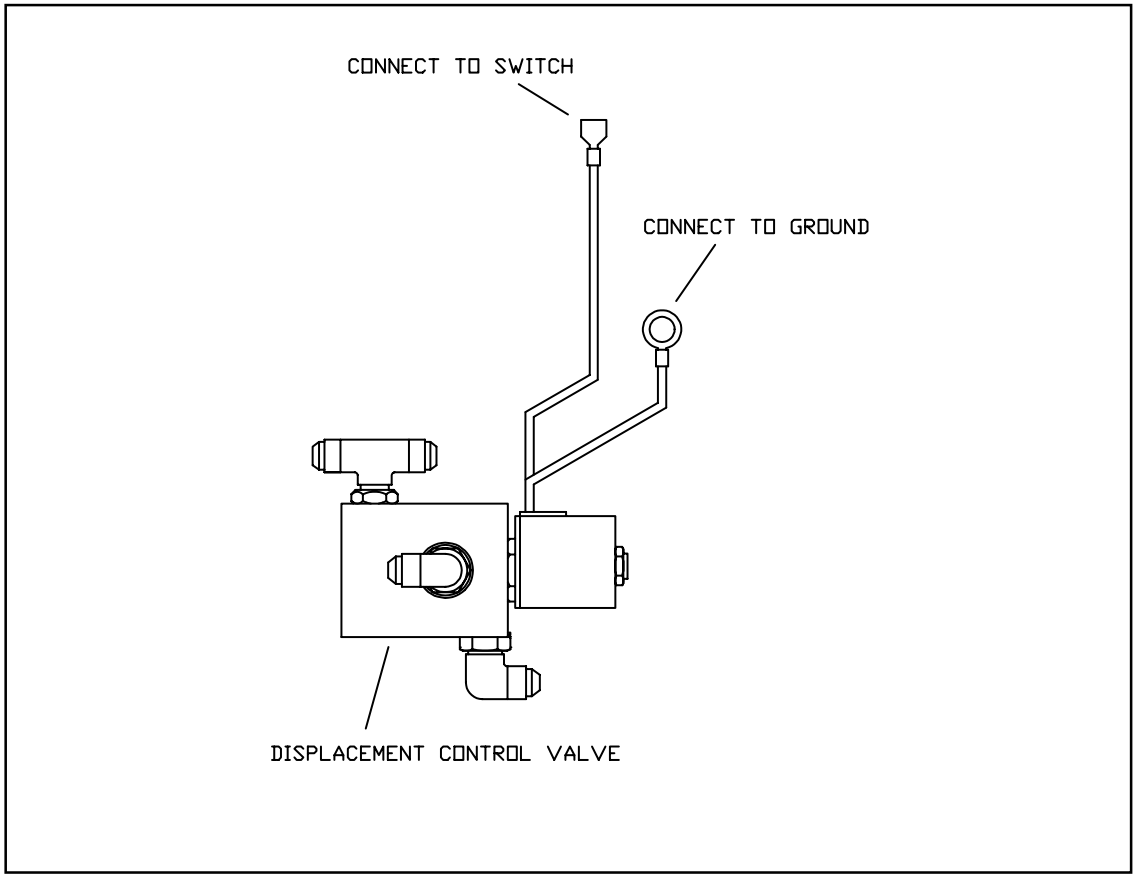


For John Deere cotton picker applications, the *MUD HOG* can be engaged in all three gears. In Case (International) picker applications the *MUD HOG* is engaged in 1st and 2nd gears only; the wobble switch prevents operation of the *MUD HOG* RWD in 3rd gear due to the design characteristics of the switch activation system and shift lever position in 3rd gear.

2. ELECTRICAL COMPONENTS AND CONTROLS continued:

B. Displacement Control Valve For Two-Speed Applications

For *MUD HOG* axles equipped with two-speed motors, a displacement control valve (DCV) is used to shift the wheel motors from full displacement to half displacement. A switch mounted in the cab is used to activate the solenoid on the DCV which supplies the motors with charge pressure to shift them. The solenoid on the DCV has two wires. One wire connects to the switch in the cab and the other wire connects to one of the mounting bolts of the DCV for a ground.



3. HYDROSTATIC CIRCUITRY DESCRIPTION

High Pressure (5500 to 6000 psi) All high pressure hoses are four spiral wire reinforced or equivalent; rated at 5000 psi working pressure or better. High pressure hoses carry hydraulic fluid under high system pressure to provide motor torque.

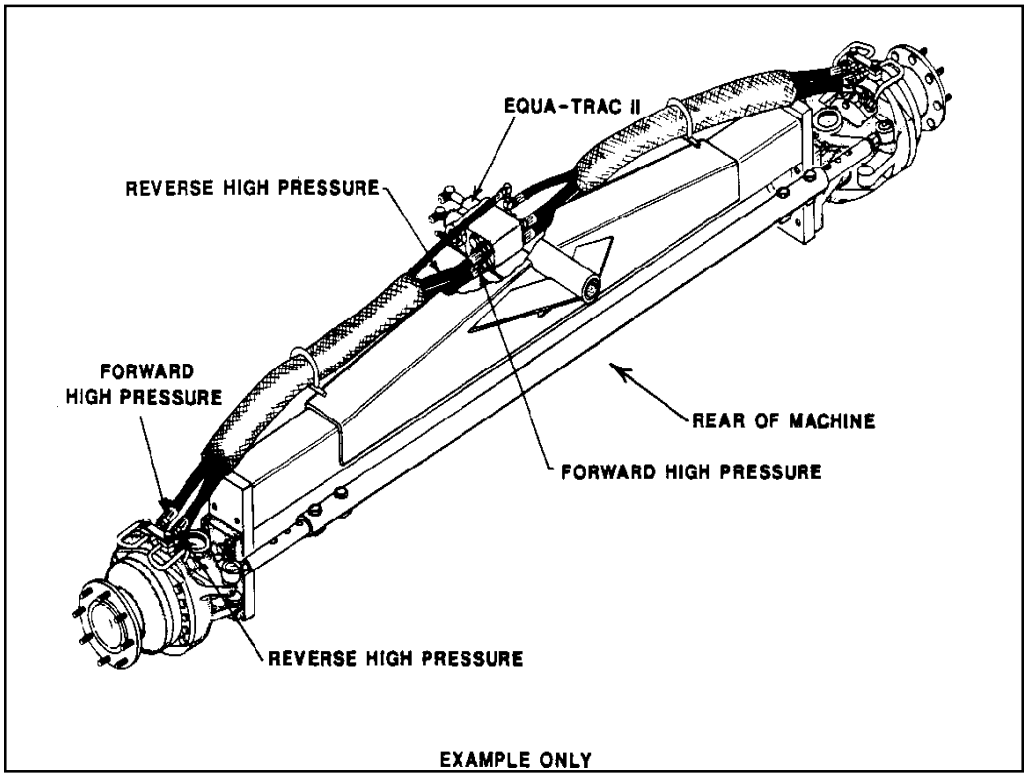
High pressure replacement hoses should always be four spiral wire reinforced and of equivalent rating as original hose. Replacement hoses can be purchased through a *MUD HOG* dealer from Fluidrive, Inc.

CAUTION: NEVER replace high pressure hoses with two or three wire braid hose. These types of hoses are NOT designed to withstand the high operating pressures in a hydrostatic system.

A. Motors to Equa-Trac II (E-T II) valve assembly: four 1/2" I.D. hoses.

Observing from the rear of the machine, the front tubes on top of each motor carry high pressure oil to the motors for forward operation of the machine. The rear motor tubes carry high pressure oil to the motors for reverse operation of the machine. The forward motor hoses connect to the bottom outlet fittings on the E-T II valve. The reverse motor hoses connect to the top outlet fittings on the E-T II valve. The E-T II valve provides an equal-traction effect in both forward and reverse operating modes.

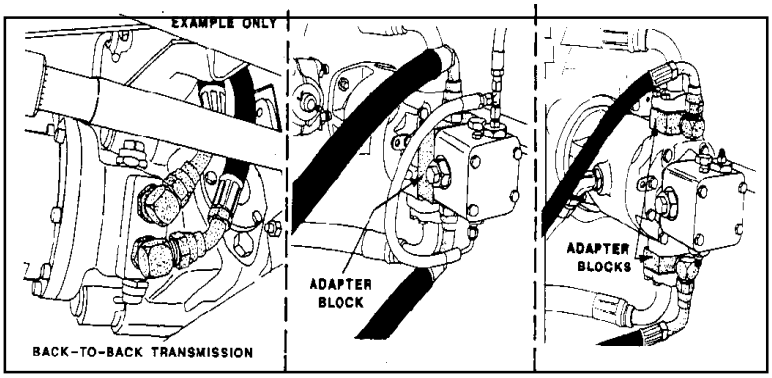
NOTE: In 2-speed *MUD HOG* units, the right hand wheel motor's forward and reverse ports are opposite the normal location. The front tube is reverse and the rear tube is forward.



3. HYDROSTATIC CIRCUITRY DESCRIPTION CONTINUED:

B. E-T II Valve to Main Hydrostatic Transmission: two 3/4" I.D. hoses.

The integral or back-to-back transmission has two large 1-1/16" test ports that are convenient to use for high pressure hose connections. The machine's service manual clarifies which is the forward and which is the reverse test port. Obtaining large enough high pressure ports in split transmissions is accomplished by providing manifold (port) adapter block(s). Selecting the wrong high pressure ports at the hydrostatic transmission would cause the rear wheels to have the opposite rotation of the front wheels. It is then necessary to switch the hoses at the transmission connections to correct the rotation direction.

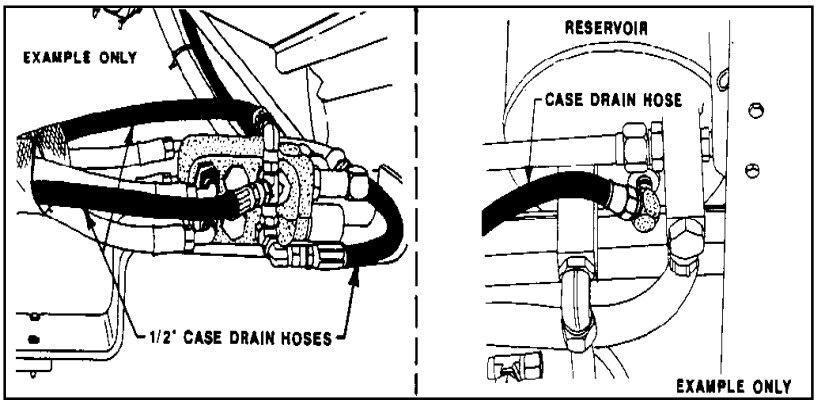


C. Case Drain Return (5-15 psi)

The case drain lines carry the motor leakage and solenoid valve drain oil back to the hydrostatic oil reservoir.

1. **Motors to E-T II Valve:** two 1/2" I.D. hoses. A case drain hose connects to each wheel motor and to the elbow fittings on the right side of the E-T II valve.

2. **E-T II Valve to Reservoir:** one 1/2" I.D. hose. The drain hose connects to a fitting on the right side of the E-T II valve and directly to a reservoir fitting, or to fittings installed in a return line to the reservoir.

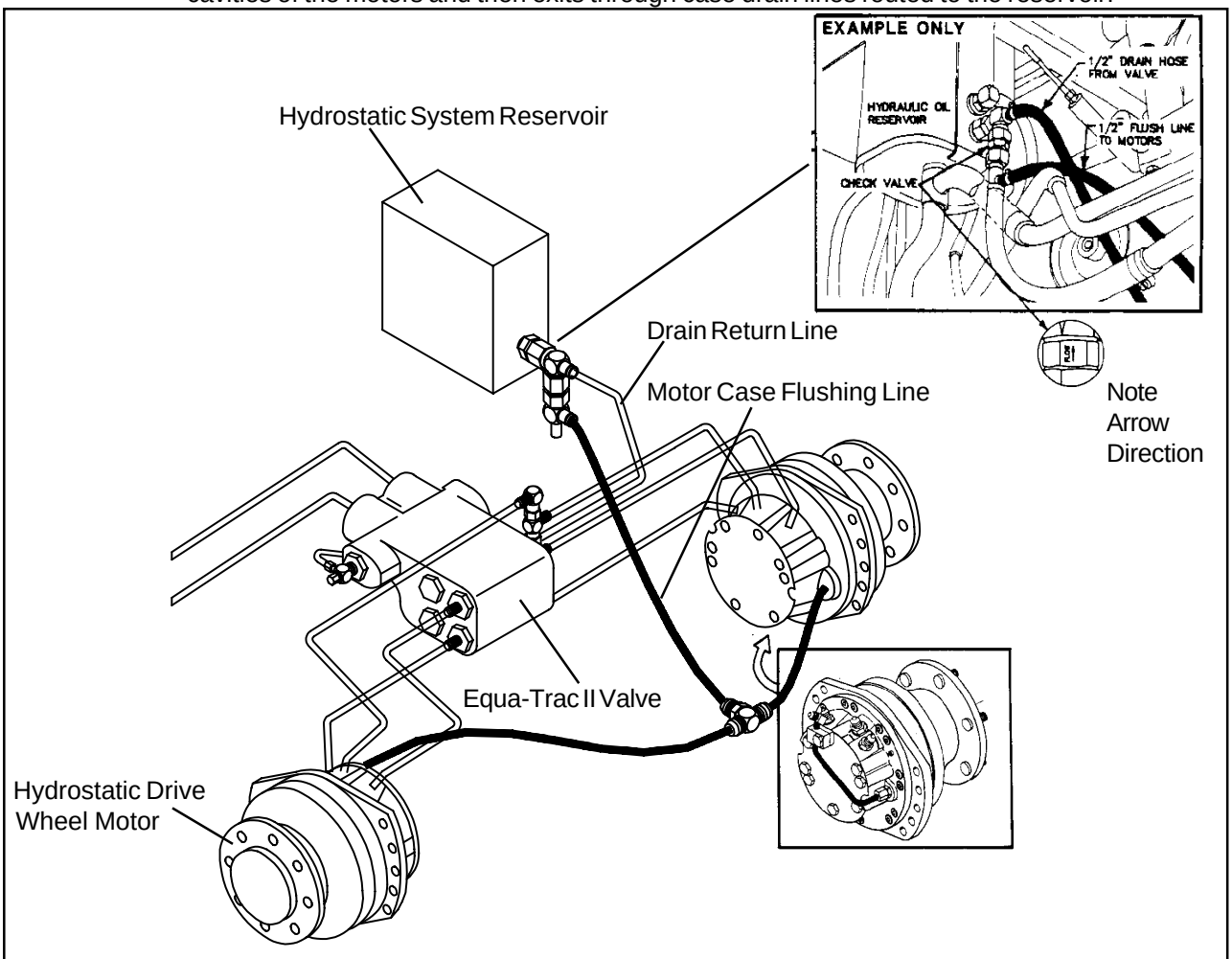


3. HYDROSTATIC CIRCUITRY DESCRIPTION CONTINUED:

D. Motor Case Flushing System (5-25 psi)

On late model *MUD HOG* System II, III and IV, combine and cotton picker kits extra lines are added to provide cooled hydraulic oil to the wheel motors. This cooled hydraulic oil "flushes" the motor case, to remove damaging high temperature oil.

The motor case flushing system consists of a line tap between the machines' oil cooler and hydraulic oil reservoir. This tap consists of a tee and a 15 psi or 20 psi check valve that allows cool oil from the oil cooler to flow to the wheel motors first. A 1/2" hydraulic hose is routed from the tap to a bulkhead tee at the E-T II Valve. Additional 1/2" hoses from the bulkhead tee to each motor, deliver cooled hydraulic oil to be distributed throughout the inner cavities of the motors and then exits through case drain lines routed to the reservoir.

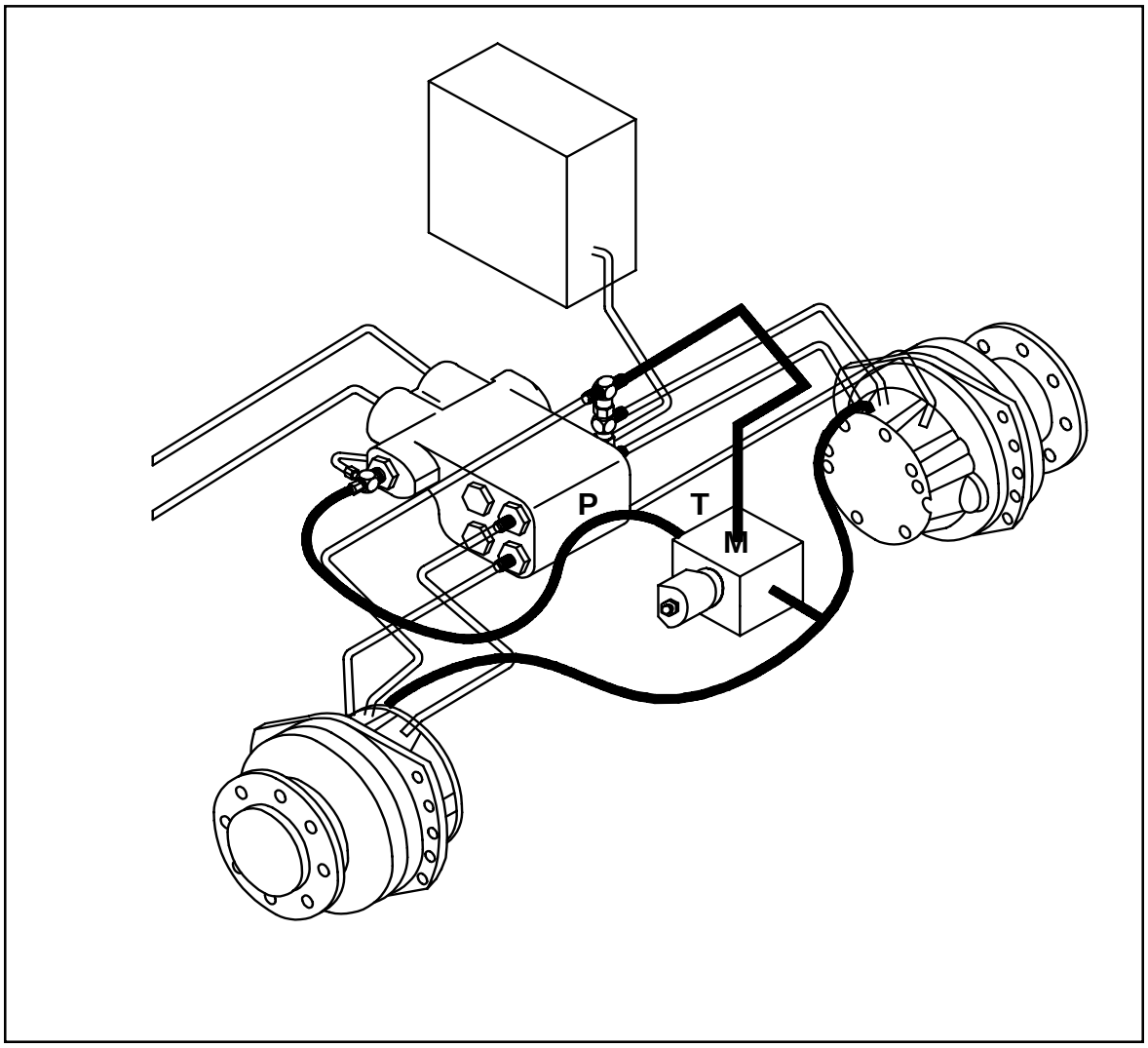


***MUD HOG* WHEEL DRIVE SYSTEM**

E. Displacement Control (charge pressure)

On *MUD HOG* units that have two-speed wheel motors, the motors are shifted from full to half displacement through the use of a displacement control valve. Energizing the solenoid on the displacement control valve shifts the wheel motors from full displacement to half displacement.

The displacement control system utilizes charge pressure from the ET-II valve to shift the wheel motors. One 1/4" hydraulic hose connects the external charge pressure tube on the ET-II valve to the port stamped "P" on the displacement control valve. Another 1/4" hydraulic hose connects the drain from the ET-II valve to the port stamped "T" on the displacement control valve. Two 1/4" hoses connect the wheel motors to the port stamped "M" on the displacement control valve.



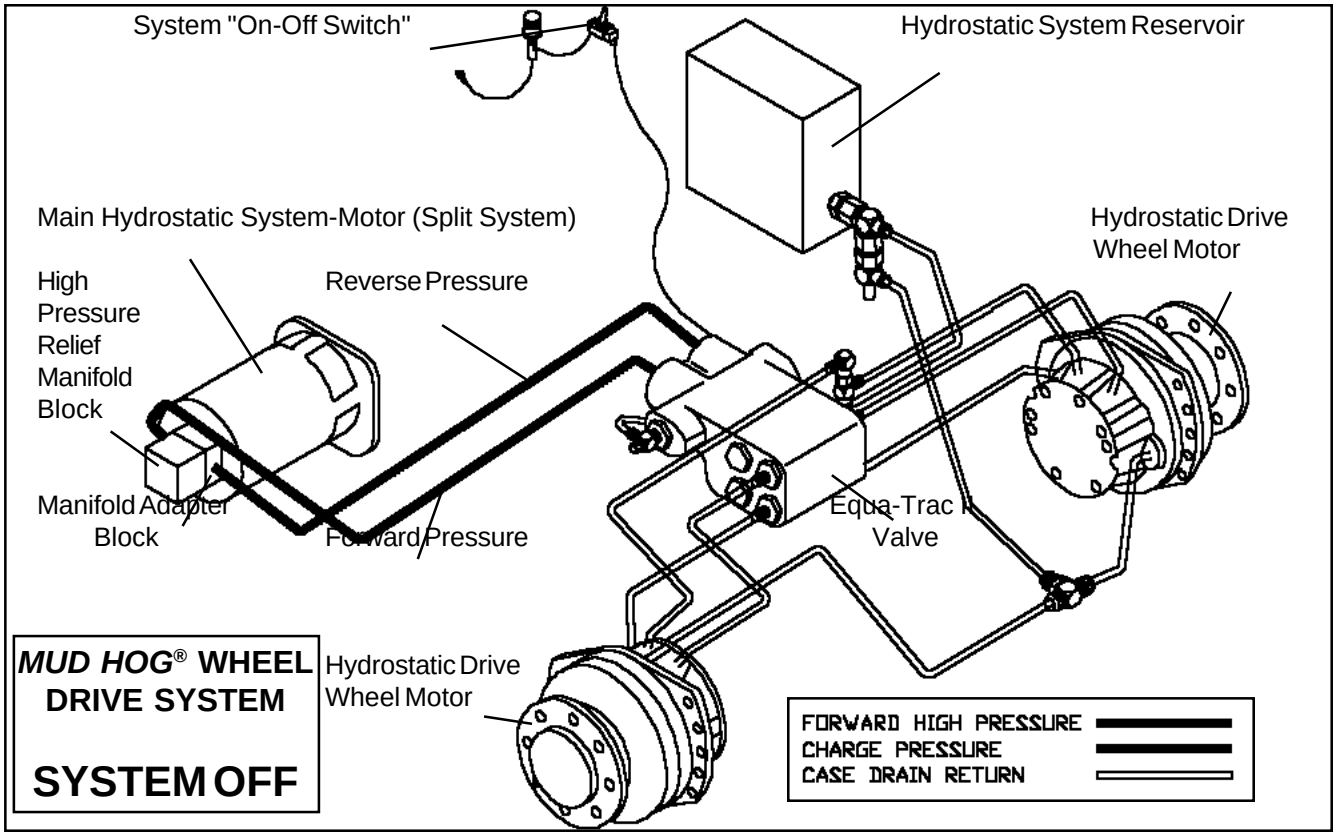
4. OPERATIONAL CIRCUIT DIAGRAMS

The *MUD HOG* rear wheel drive circuit utilizes hydraulic oil flowing at three different pressures; change pressure, system pressure, and motor case drain pressure. These pressures are shown in the diagrams in this section.

CHARGE PRESSURE--Charge pressure is needed to provide the minimum oil pressure that is necessary for operation, cooling and lubrication during system operation. It also provides a "charge" to the system pressure that propels the machine. During the operation of the machine, the system pressure will fluctuate due to the supply demands. Moving over rough terrain and the rolling resistance from the tires in contact with the ground surface, will contribute to the reduction of the proper amount of supply pressure to power the wheel motors. Charge pressure helps to maintain a near constant, laminar and positive oil flow at system pressure. Charge pressure oil flow is generated by the fixed displacement charge pump driven off of the main hydrostatic variable placement pump.

A. *MUD HOG* SYSTEM OFF - FORWARD OR REVERSE

When the *MUD HOG* system is OFF and the main hydrostatic transmission is in neutral, charge pressure (200 to 250 psi) from the charge pump is supplied to the Equa-Trac II (E-T II) valve via an internal shuttle spool (no external charge pressure hose). Charge pressure holds the main selector spool of the E-T II valve in the OFF position; thereby preventing the supply of high pressure oil to the wheel motors. Oil flow at a lower pressure (5-15 psi) is circulated through the remainder of the E-T II valve and rear drive wheel motors. This oil flow keeps the wheel motors lubricated, cooled and purged from air to promote longer component life. If the main hydrostatic transmission is in the forward or reverse operating mode, high pressure (5500 to 6000 psi) will reach E-T II valve, but the pressure in all hoses between the E-T II valve, wheel motors and reservoir will remain at 10 to 15 psi as shown below.

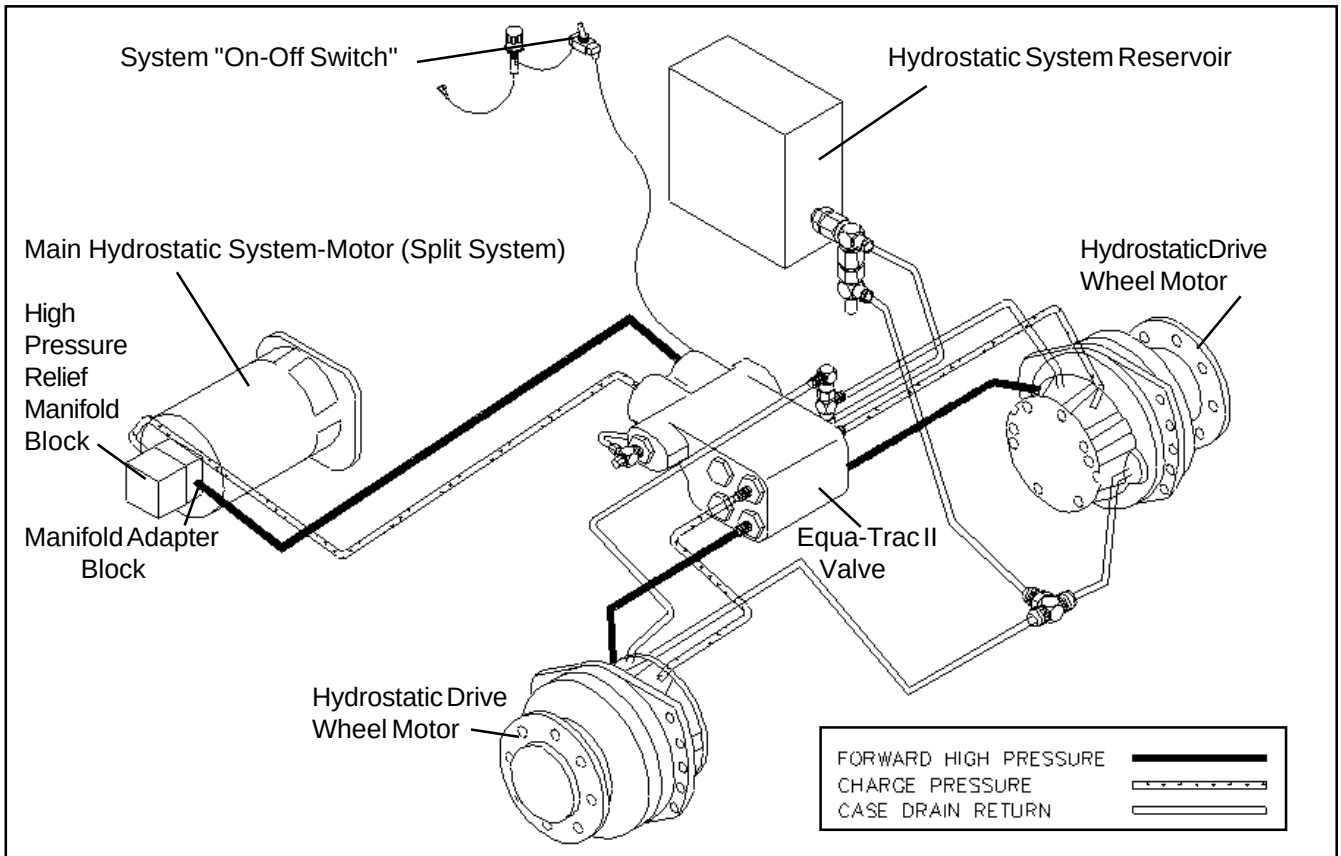


4. OPERATIONAL CIRCUIT DIAGRAMS continued:

SYSTEM PRESSURE--System pressure (5500 to 6000 psi) is generated by the variable displacement pump, and is directed to the fixed displacement motor (split systems). The high pressure oil flow passes through the manifold adapter block(s); if equipped, and on to the Equa-Trac II valve, where the flow is divided to drive the right and left wheel motors.

B. *MUD HOG*® SYSTEM ON - FORWARD

When the *MUD HOG* system is ON, the solenoid coil at the E-T II valve is energized. Charge pressure oil initially moves the selector spool in the valve toward the ON position. After the initial flow of charge pressure oil to the wheel motors, further movement of the selector spool opens ports connected to the high system pressure flow coming from the forward pressure side of the fixed displacement motor, and through the 3/4" high pressure hoses. The high pressure oil flow is equally split between the two wheel motors as the oil passes through the forward flow divider spool within the valve. Oil flow returns from the wheel motors at charge pressure and passes through the reverse side of the E-T II valve and back to the fixed displacement motor. Motor case drain return oil flows from the wheel motors and E-T II valve and back to the cooler and reservoir.



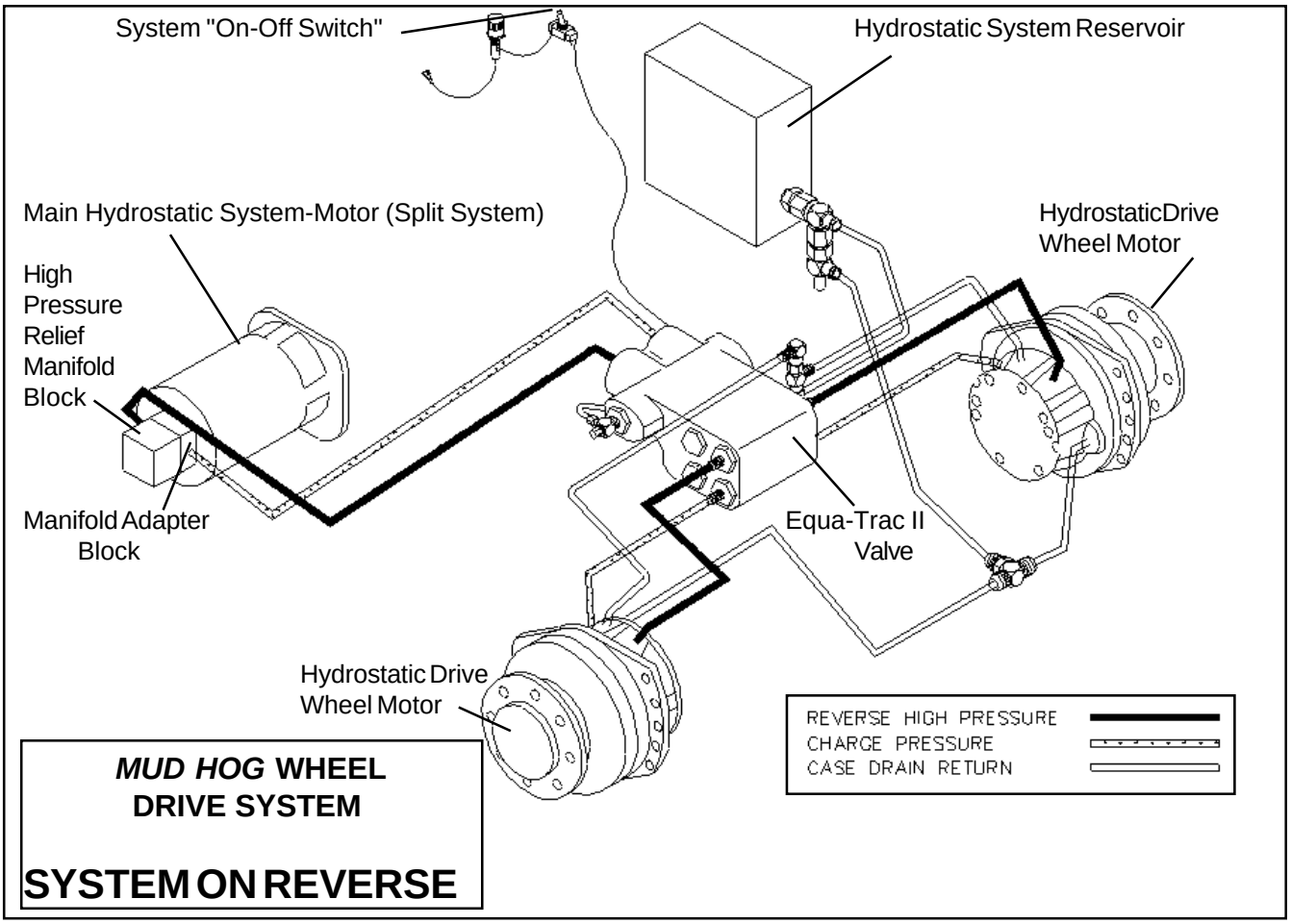
***MUD HOG* WHEEL DRIVE SYSTEM**

SYSTEM ON FORWARD

4. OPERATIONAL CIRCUIT DIAGRAMS continued:

C. *MUD HOG* SYSTEM ON - REVERSE

Oil flow in the "reverse" system ON diagram is similar to the oil flow in the "forward" mode, except that the flow of oil in the high pressure lines flows in the opposite direction. High system pressure is delivered from the reverse side of the hydrostatic system motor to the reverse inlet port of the E-T II valve. The oil then flows through the reverse flow divider spool in the valve, and is equally split between the wheel motors. Oil flow returns from the forward inlet ports of the wheel motors at charge pressure and passes through the forward side of the E-T II valve, and back to the fixed displacement motor. Motor case drain return oil flows from the motors and valve back to the cooler and reservoir.



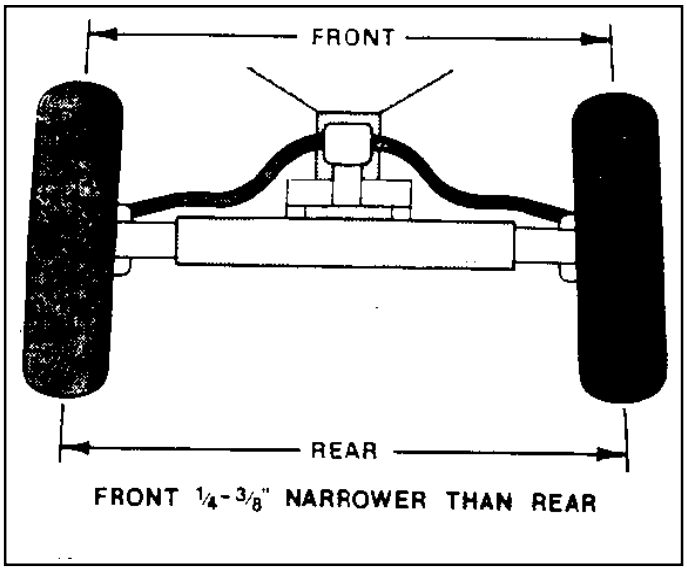
5. ADJUSTMENTS AND MAINTENANCE

The following points should be reviewed in order to reduce down time by regular observation and maintenance.

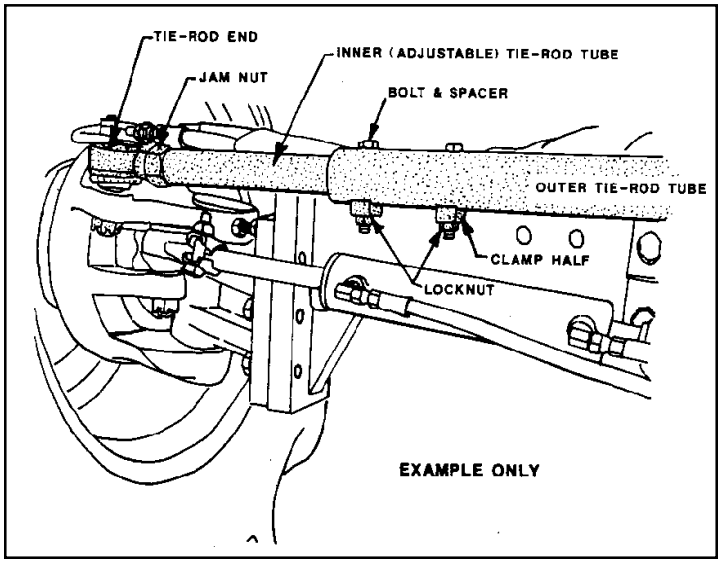
A. CHECKING AND ADJUSTING REAR WHEEL TOE-IN

The rear wheels should be adjusted to have 1/4" to 3/8" toe-in to the front (closer together in the front than in the rear). Measure toe-in from the center of one tire to the center of the other tire; preferably at the height of the wheel center, and the same height from the ground in the front and in the rear.

5. ADJUSTMENTS AND MAINTENANCE continued:



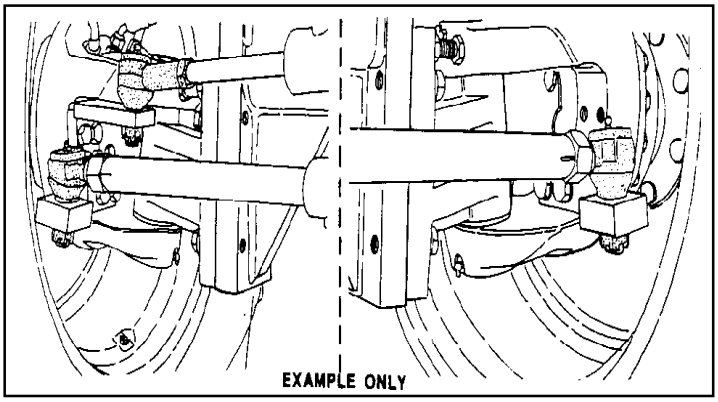
Toe-in adjustment, if necessary: Place rear wheels in a straight ahead position. Remove bolts, spacers, clamp halves and locknuts from both ends of the tie rod tube. Loosen both tie-rod jam nuts. Turn the adjustable inner tubes as necessary to align a set of holes in the unbolted ends of the tie-rod tube. NOTE: Attempt to maintain equal amounts of exposed threads on both tie-rod ends.



After toe-in is adjusted to proper specification, reinstall bolts, spacers, clamp halves and lock nuts in outer tie-rod tube. Torque locknuts to 60-80 ft. lbs.

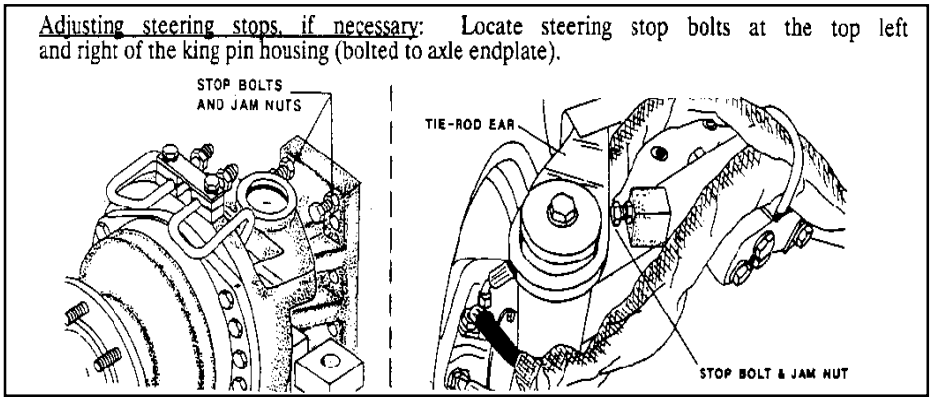
5. ADJUSTMENTS AND MAINTENANCE continued:

B. The tapered end(s) of both the tie-rod and power steering cylinder(s) need to be tight at all times. On an initial installation, these should be checked about every four hours the first day, then every day the first week. Eventually the tapered surface work hardens, and cannot be tightened.



C. The adjustable wheel stops should be set to take full advantage of the maximum steering angle that is available, unless the steering needs to be limited to avoid tire interference. The wheel stops on each wheel drive assembly should be set to minimize the load on the tie-rod.

Adjusting steering stops, if necessary: Locate steering stop bolts at the top left and right of the king pin housing (bolted to axle endplate).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STOP BOLTS AND JAM NUTS
TIE-ROD EAR
STOP BOLT & JAM NUT

PROCEDURE FOR COMBINES (COTTON PICKERS SIMILAR, BUT USE ONLY TWO STOP BOLTS)

1) Loosen the jam nuts and screw all four stop bolts completely in.
2) Turn the steering wheel a full turn to the right.
3) Adjust the left rear and right front stop bolts to touch the edge of the wheel motor mounting frame.
4) Tighten the jam nuts.
5) Turn the steering wheel a full turn to the left.
6) Adjust the right rear and left front stop bolts to touch the wheel motor frame.
7) Tighten the jam nuts.

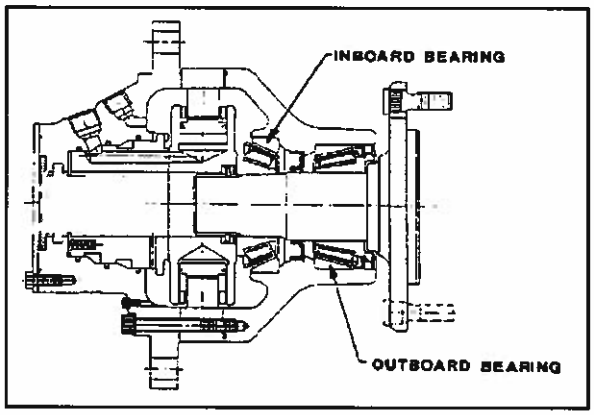
Check for adequate tire clearance with narrow tread center settings and extreme axle oscillation; with wheels fully turned in both directions. Make any necessary adjustments and return the wheels to a straight ahead position.

5. ADJUSTMENTS AND MAINTENANCE continued:

D. WHEEL MOTOR BEARINGS - NO MAINTENANCE REQUIRED

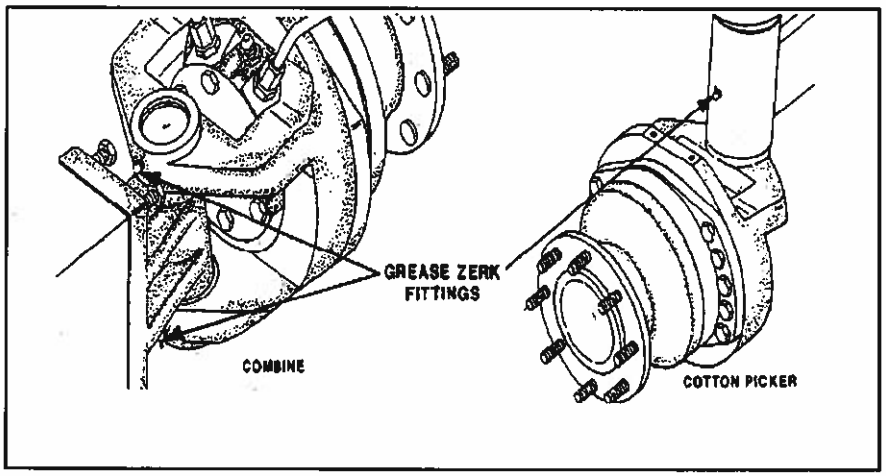
General Information:

The outboard bearing of each wheel motor is lubricated with grease in a permanently sealed cavity. The inboard bearing of each wheel motor is lubricated by the hydraulic oil in the motor case; therefore no maintenance is required for either bearing.



E. KING PIN BUSHINGS

Grease king pin bushings by pumping a high quality bearing grease into the upper and lower grease zerk fittings located on each wheel motor steering frame for combines; or into grease zerk fitting on each stub axle for cotton pickers, at about every 50 hours of machine operation.



F. WHEEL LUG NUTS

Torque the wheel lug nuts securing the wheel and tire assembly to the wheel motor flange to 300-320 ft. lbs. Overtightening the lug nuts could damage the wheel studs. Periodic checks should be made to make sure the nuts are tight.

SECTION B: EQUA-TRAC II VALVE OPERATION

(covered by U.S. Patent No. 4,766,727 and by numerous foreign patents)

1. GENERAL INFORMATION - PRINCIPLE OF OPERATION

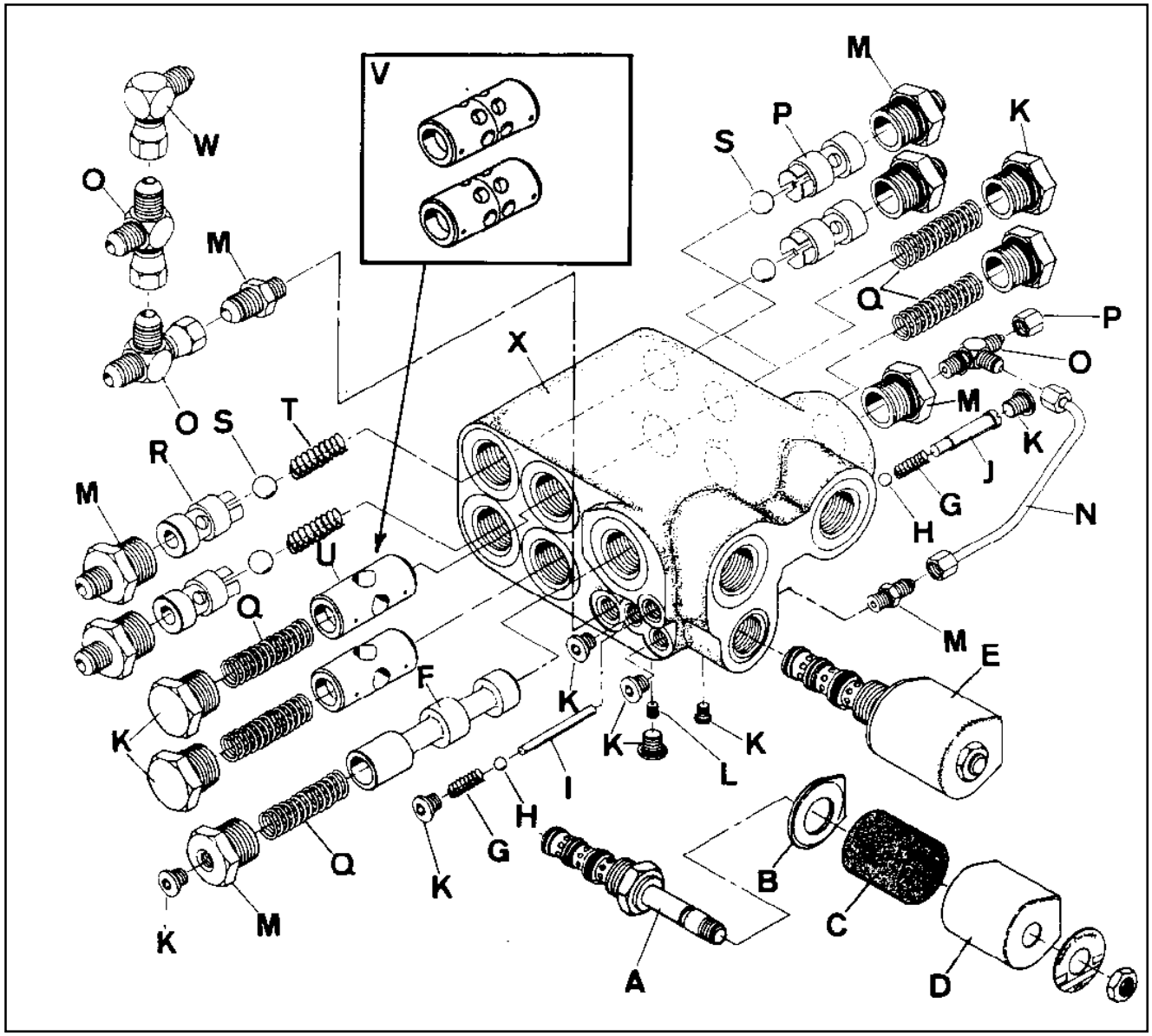
The Equa-Trac II (E-T II) valve is typically mounted off the rear drive axle of the machine, between the wheel motor drives. The E-T II is a spool-type valve controlled by a 12-volt electric solenoid cartridge valve. An ON-OFF switch in the operator's cab activates the electric solenoid valve. This movement of the spool opens up internal passages within the valve, to permit high system pressure oil to flow to the wheel motors. The oil flow is equally split between the wheel motors by passing through a forward or reverse flow divider spool within the valve. When the E-T II valve solenoid is not activated, oil flow through the valve is bypassed internally in a recirculating loop.

SECTION B

EQUA-TRAC II VALVE OPERATION

2. PICTORIAL COMPONENT IDENTIFICATION

A - Solenoid cartridge valve w/plunger
B - Cover Plate
C - Solenoid Coil
D - Solenoid coil housing
E - Solenoid cartridge valve assembly
F - Selector spool
G - Spring, low pressure shuttle
H - Check ball, low pressure shuttle
I - Dowel pin, low pressure shuttle
J - Spring spacer, low pressure shuttle
K - Plug
L - Orificed plug
M - Adapter
N - Pilot pressure tube
O - Tee
P - Steel cap
Q - Flow divider spring
R - Check valve (ball seat)
S - Check ball
T - Check valve spring
U - Flow divider spool (standard design)
V - Split flow divider spool (rev. design)
W - 90 degree elbow
X - Machined valve body

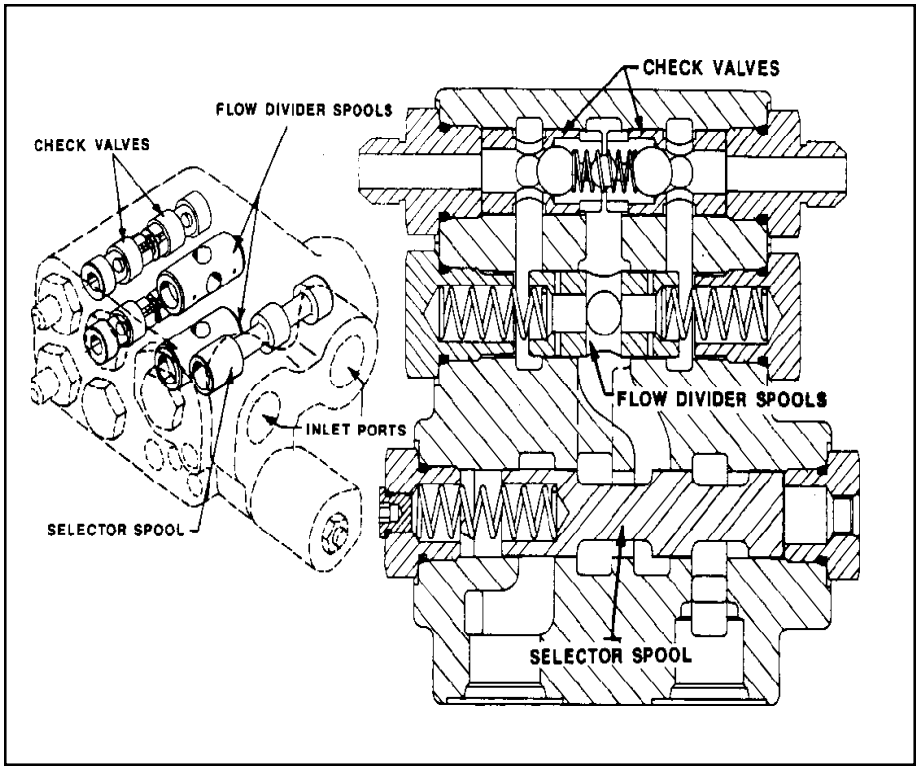


3. FUNCTION OF INTERNAL COMPONENTS

The major components within the Equa-Trac II valve consist of:

- Selector spool
- Flow divider spools
- Check valves

In the front half (inlet port side) of the E-T II valve, the selector spool controls the path of oil in the charge and high system pressure circuits, to the rear portion of the valve, which houses flow divider spools and check valves.



FLOW DIVIDER SPOOLS (CURRENT PRODUCTION UNTIL LATE 1989/EARLY 1990)

When the solenoid coil is energized, oil flow from the main fixed displacement motor enters the E-T II valve through the forward or reverse inlet port (depending on operation mode) and is directed by the selector spool to the forward or reverse flow divider spool. The flow of oil is equally split through a divider spool and is directed through the forward or reverse check valves to the wheel motors.

The flow divider spool is spring loaded to center, from each end. It has two equally sized fixed orifices in the center. When the rear drive wheel traction is equal, the pressure drop on both sides of the flow divider spool is the same, and the spool is located at dead center. If one of the drive wheels begins to slip, the pressure drop on that side of the flow divider spool becomes greater than the pressure drop on the opposite end. The spool will move to close off the passage to the wheel motor and tire that is slipping. The main oil flow will then be diverted to the other wheel motor. When the slipping wheel regains traction, the pressure drop across the fixed orifices in the flow divider spool again becomes equal and the spool returns to center. In actual operation, the movement of the spool occurs repetitively causing the spool to modulate frequently.

EQUA-TRAC II VALVE OPERATION

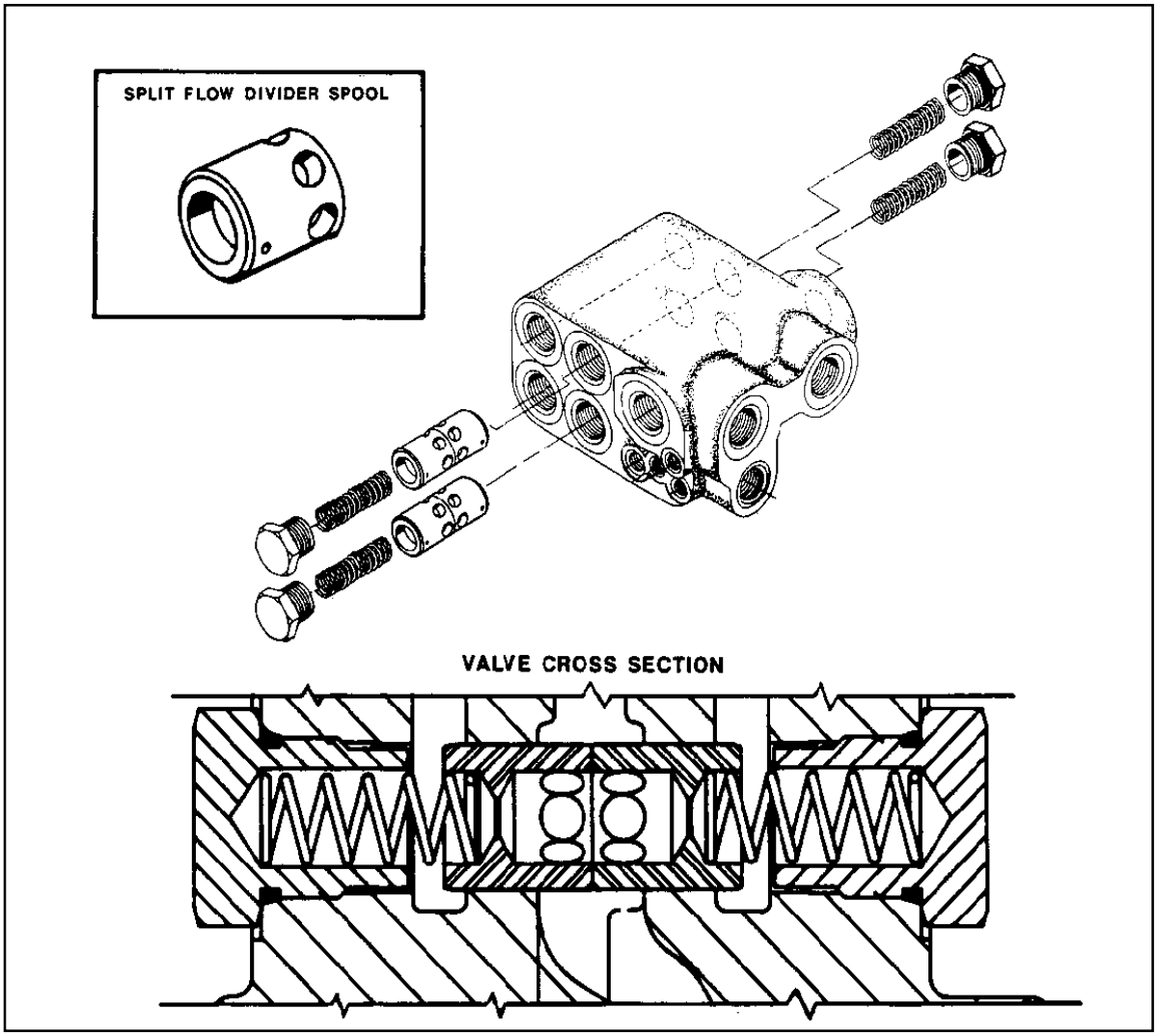
3. FUNCTION OF INTERNAL COMPONENTS continued:

SPLIT FLOW DIVIDER SPOOLS (INSTALLED IN LATE MODEL VALVES)

These types of flow divider spools have been designed to replace the existing flow divider spools found in early model E-T II valves, in *MUD HOG* kits sold up to late 1989/early 1990.

The split flow divider spools operate in a similar manner to the standard flow divider spools in that pressure is maintained to the non-spinning wheel when the opposite wheel is spinning. However, the split flow divider spools provide the additional feature of limiting the maximum amount of flow to the rear drive axle. For example, with the split divider spools and their .328 inch diameter orifices, approximately 18 gpm can travel to each wheel motor before the split spool shifts, limiting additional flow to that wheel motor. Therefore, a maximum oil flow of approximately 36 gpm can travel to the RWD if both split spools are activated.

With the standard flow divider spool, if both rear wheels are spinning, the spool may stay centered and the full oil flow from the hydrostatic pump may travel to the wheel motors.



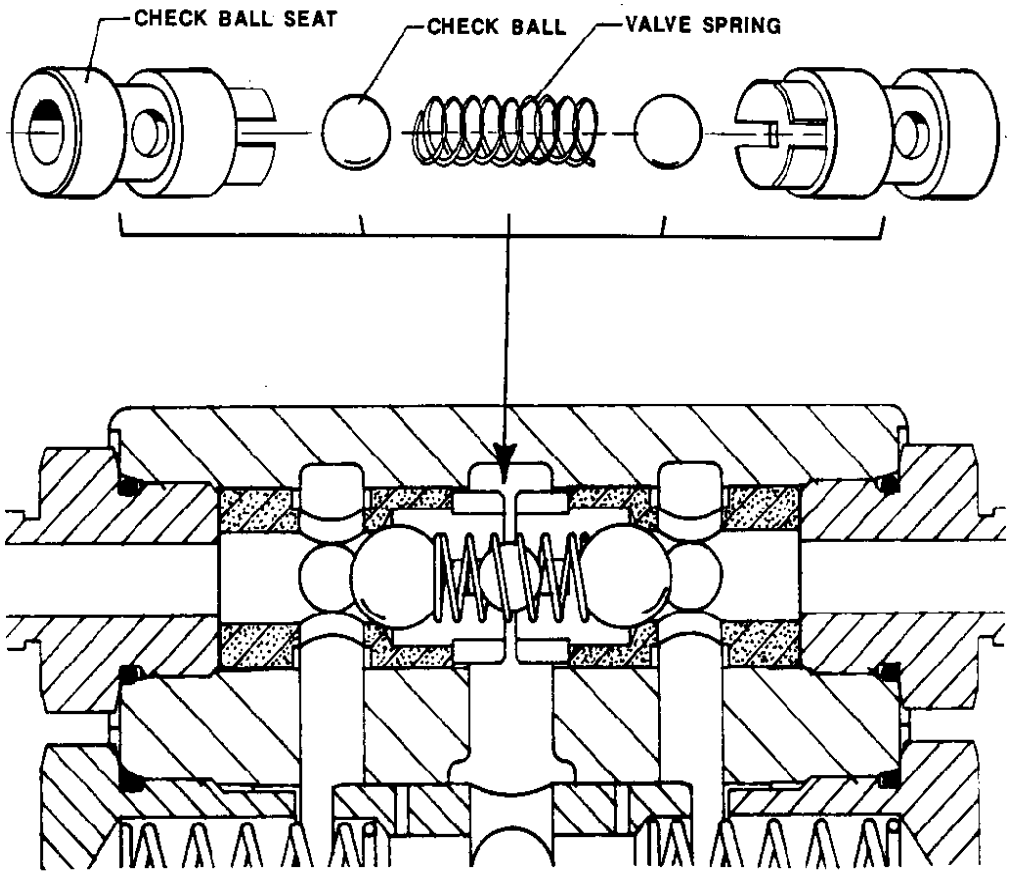
SECTION B

3. FUNCTION OF INTERNAL COMPONENTS continued:

CHECK VALVES

The basic function of the check valve is to prevent the full amount of return oil (at charge pressure) from the wheel motors, from flowing back through the valve and flow divider orifice(s). This oil flow situation would develop a large pressure drop. The check valves will allow some of the return oil flow (from wheel motors) to pass through the check valves themselves and the remaining flow to pass through the flow divider orifice(s), to reduce the amount of pressure drop in the return circuit.

A check valve consists of a check ball seat, spring and 9/16 inch diameter check ball. As the return oil flow increases, the check ball is moved off of its seat to allow some of the flow to pass through the check valve. There are four check valves in the E-T II valve.

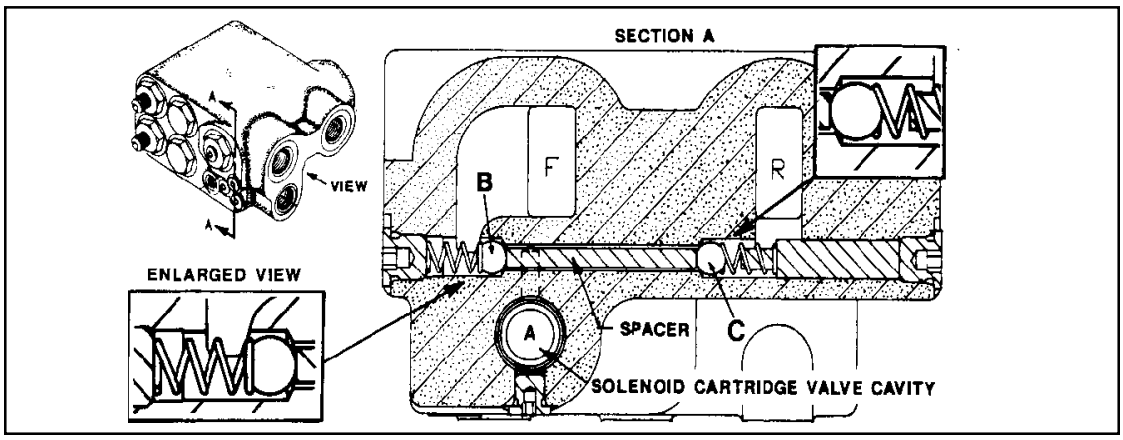


VALVE CROSS SECTION

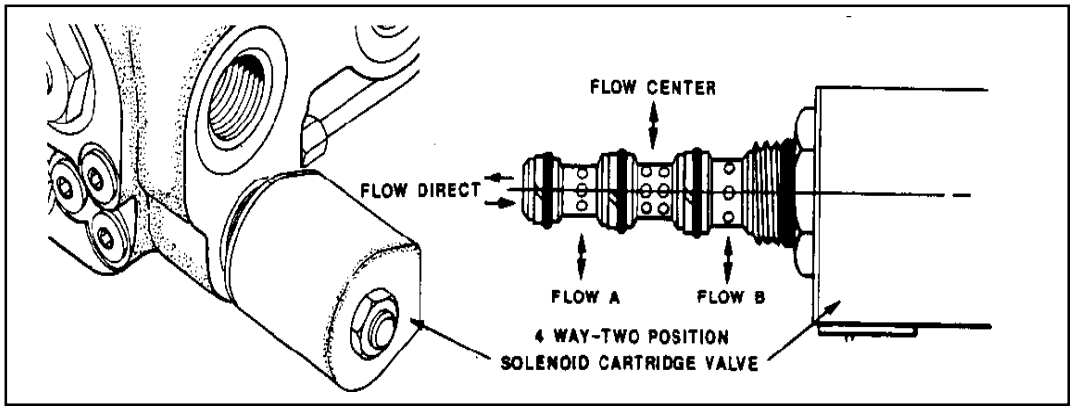
4. OPERATION DESCRIPTIONS

LOW PRESSURE SHUTTLE SYSTEM (CONTROL PRESSURE SUPPLY)

The low pressure shuttle system of the Equa-Trac II (E-T II) valve is simply a combination of two check valves between the forward and reverse sides of the hydrostatic circuit, ahead of the selector spool. The shuttle system provides pilot (control) pressure oil to passage A at all times; even when the *MUD HOG* is off. Passage A feeds to solenoid cartridge valve which directs charge pressure oil to either engage or disengage the selector spool. There is always charge pressure on the return side of the hydrostatic circuit; for example, in the forward operating mode there is system pressure oil in the forward (F) cavity and charge pressure oil in the reverse (R) cavity. In this situation, the system pressure will be higher than the charge pressure. System pressure oil will close off check ball B. When B closes off, check ball C will open up because the spacer between balls B and C will not allow both balls to seat at the same time. When check ball C opens, this allows charge pressure oil to flow from the return (reverse) side of the circuit, past check ball C, past the spacer, and into passage A.

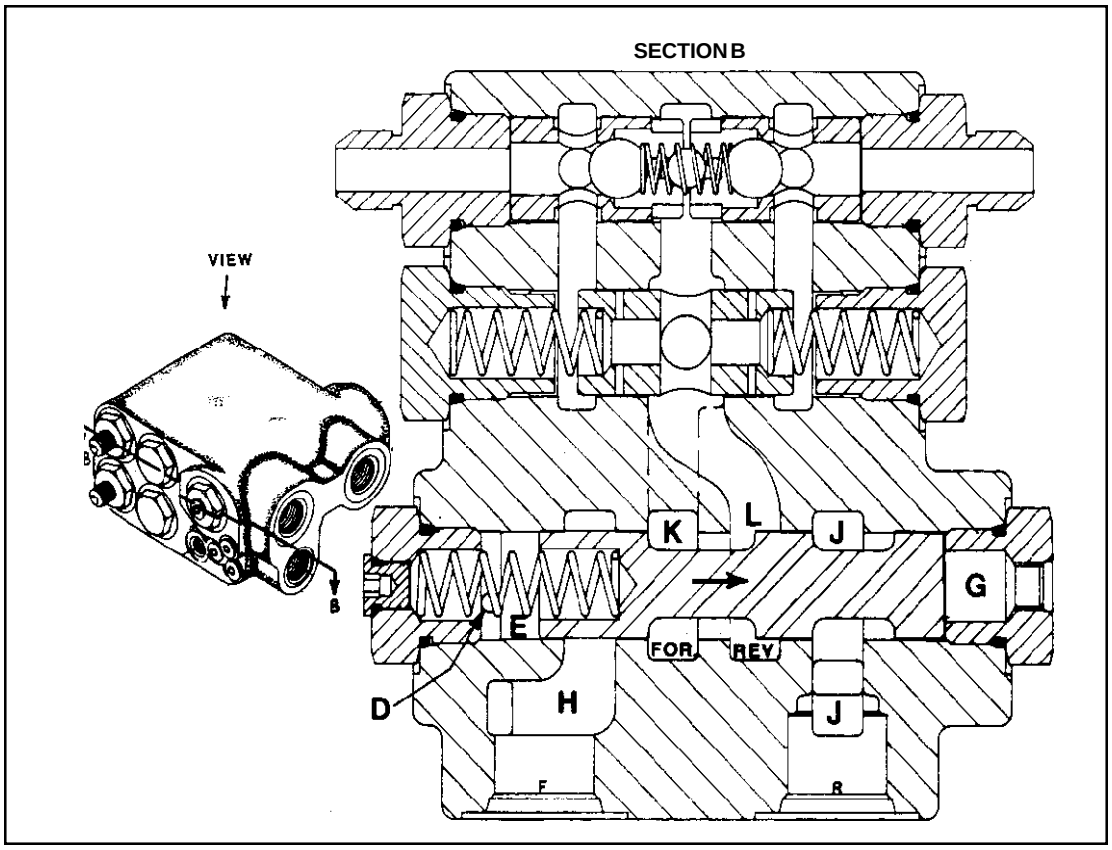


The solenoid cartridge valve is a 4-way valve that takes the charge pressure oil and directs it to one end of the selector spool or the other. If there is charge pressure oil supplied to one end of the spool, the opposite end will drain through the solenoid cartridge and back to the hydraulic oil reservoir (tank). When the solenoid valve is energized, the cartridge directs charge pressure oil to the "ON" end of the spool and drains the "OFF" end (spring end). When the solenoid valve is deenergized, the cartridge directs charge pressure oil to the "OFF" end and drains the "ON" end of the spool.



EQUA-TRAC II VALVE - SYSTEM OFF (DISENGAGED)

4. OPERATION DESCRIPTIONS continued:



With the *MUD HOG* system off, charge pressure oil in the E-T II valve is at the OFF (spring) end (cavity E) of the selector spool and cavity G is exposed to the tank through the solenoid cartridge valve. Charge pressure oil in cavity E combined with the spring force holds the spool in the OFF position. The spool prevents system pressure oil from entering either the forward or reverse inlet port and the rest of the valve; therefore no high pressure oil is delivered to the wheel motors. Passage D controls the speed that the spool shifts to the OFF position because the charge pressure oil has to flow through the same passage to get into cavity E to shift the spool.

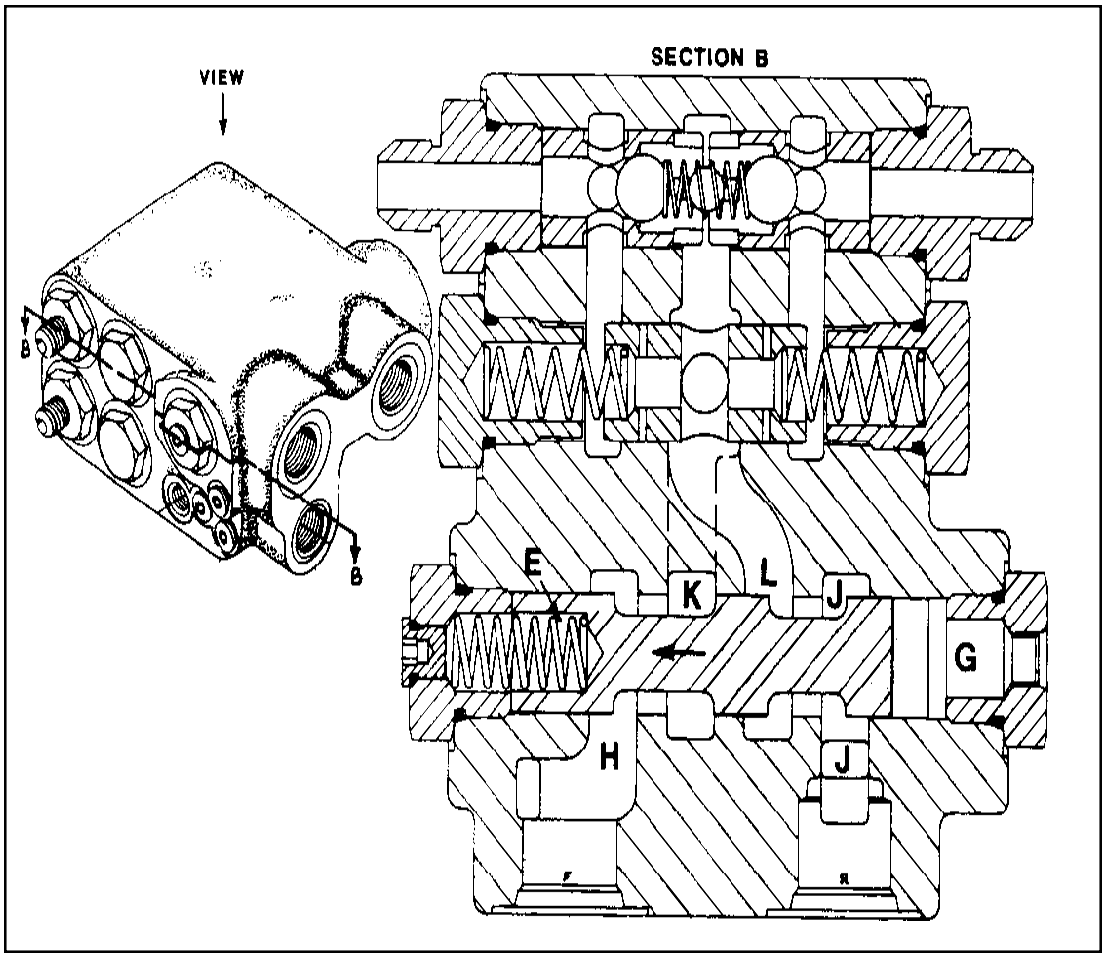
In the OFF position of the spool, cavities H and J are closed off from cavities K and L. Cavities H and J are the forward and reverse pressure inlet cavities; they will always be exposed to either system pressure or return (charge) pressure oil whether in forward or reverse. Cavity K opens an oil flow path to the forward pressure ports of the wheel motors, after first passing through a flow divider. Cavity L similarly opens an oil flow path to the reverse pressure ports of the motors, also passing through the flow divider.

The spring is located at the OFF end of the spool in order to bias the spool to the OFF position in the event of an engine failure or when the machine has to be towed and there is no charge pressure oil flow to move the spool to the OFF position.

NOTE: THE SELECTOR SPOOL PORTION OF THE VALVE CROSS-SECTION ILLUSTRATION HAS BEEN SIMPLIFIED.

EQUA-TRAC II VALVE - SYSTEM ON (ENGAGED)

4. OPERATION DESCRIPTIONS CONTINUED:



When the toggle switch in the cab is in the ON position, the coil within the solenoid valve is energized. Passages in the solenoid valve cartridge are opened and initially, charge pressure oil is delivered to cavity G, while oil in cavity E is drained to tank.

When the spool arrives at its full ON position, passage H is open to passage K, which provides forward system pressure to the forward pressure inlet ports on the motors. Passage L is open to passage J which allows return flow (at charge pressure) to come from the motors and back to the return side of the hydrostatic circuit. In the reverse operation mode, the process is switched, where passages L and J are open to each other to provide reverse system pressure to the reverse pressure inlet ports on the motors. Passages H and K allow return flow to come from the motors.

When the *MUD HOG* system is first engaged and charge pressure oil is introduced to cavity G, the orifice in passage D (See OFF diagram) controls the rate that the oil is exhausted from cavity E while the spool shifts to the ON position. Passage D is an internal passage in the valve casting. The passage between the solenoid cartridge valve and the ON end of the spool (opposite spring end) is an external steel tube.

SECTION C

SYSTEM TROUBLE SHOOTING AND TESTING FOR MUD HOG SYSTEM II, III and IV REAR WHEEL DRIVE

PRELIMINARY TROUBLESHOOTING CHECKS

1. With the engine of the machine shut off, check for evidence of external oil leakage around seals, housings, or hose connections. Also check for pinched or kinked hoses and steel lines that could restrict oil flow and cause excessive heat build-up in the hydraulic oil

2. Check hydraulic oil level in reservoir and add the correct amount and type of hydraulic oil, if necessary.

3. Check the quality of the oil; change if milky, dirty or discolored. Also smell the oil. A burned odor indicates excessive heat that can destroy the lubricating qualities of the oil. Again, the oil should be changed if this condition is found. Determine the cause of the excessive heat and correct it.

4. Determine if the hydrostatic filter is plugged or damaged. A filter that has failed will permit oil to bypass the system, affecting system operation and tests. If the filter is plugged, examine the contamination to determine what may have caused the failure.

5. Check the maintenance records with the machine to determine if the recommended service procedures have been made at the proper intervals. Check for previous reports of unusual, frequent or similar failures.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REMEDY
1) Performance of RWD is sluggish (poor)	A) Operating with transmission gearing too low	System is more effective in higher gear. Refer to System Operation section of this manual.
	B) Incorrectly plumbed main high pressure lines (For & Rev)	Refer to MUD HOG® Installation/ Operation Manual for correct plumbing procedure.
	C) Weak high pressure relief valve	Refer to machine service manual for proper setting.
	D) Excessive case leakage from MUD HOG® system: 1) From wheel motor (s) 2) From E-T II valve	See test procedure No. 1, page 31
	E) Inadequate charge pressure	See test procedure No. 1, page 31
2) RWD operates in Forward, but not in Reverse OR operates in Reverse, but not in Forward	A) Excessive Case Leakage B) Electrical circuit malfunction C) Stuck spool in E-T II valve	See test procedure No. 1, page 31

SYSTEM TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REMEDY
3) One wheel on RWD is dragging or locked up.	A) Incorrectly mounted high pressure hoses on hydraulic wheel motors.	Refer to MUD HOG Installation/ Operation Manual for proper hose routing.
	B) Hydraulic wheel motor is locked up due to internal component failure.	With the MUD HOG system "OFF" (no Forward or Reverse system pressure) and with the tire off the ground, rotate tire by hand, if the tire will not rotate, then the wheel motor is locked up. Service or replace wheel motor. See Section E of this manual.
4) RWD is not functioning.	A) Blown fuse.	Replace fuse.
	B) ON-OFF switch shorted out.	Replace switch.
	C) Disconnected or broken electrical wire.	Reconnect or replace with 16 gauge wire .
	D) Solenoid valve in E-T II valve not working due to: 1) Solenoid valve spool not shifting. 2) Coil inside solenoid valve shorted out. 3) Loose wire connection(s). 4) Improper grounding.	See test procedure No. 2, page 32.
	E) Main spool in E-T II valve not shifting. F) Excessive motor leakage. G) Low hydrostatic fluid level.	See test procedure No. 2, page 32.

NOTES

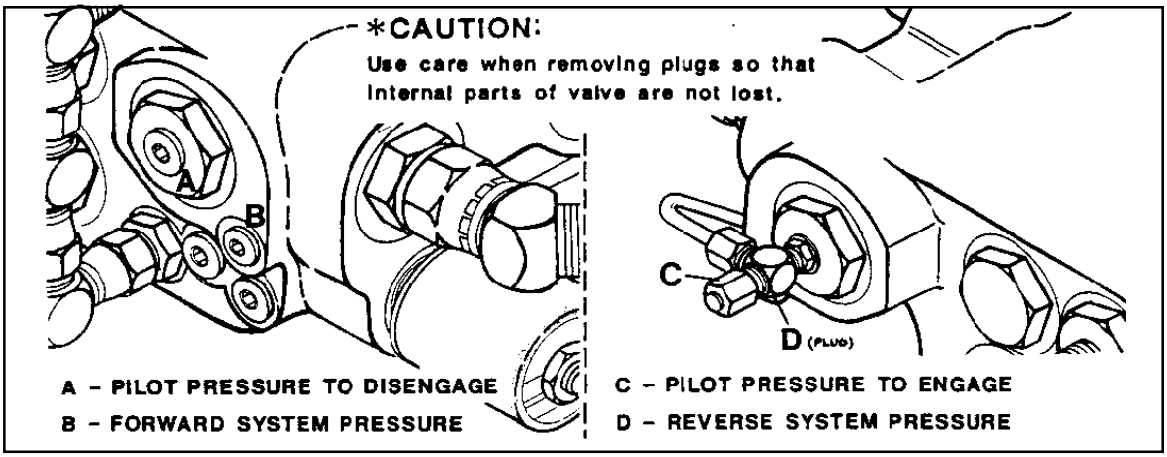
SECTION C

TEST PROCEDURE NO. 1

PROBLEM/CAUSE: RWD SLUGGISH/EXCESSIVE LEAKAGE OR INADEQUATE CHARGE PRESSURE

First make sure that the outside of the Equa-Trac II (E-T II) valve is free from any dirt or grease. Dirt must NOT be allowed to enter the valve when removing any of the valve components.

Install 7500 psi (or greater) pressure gauges in both forward and reverse test ports. Install 500 psi (or greater) gauges in both pilot pressure ports (Engage and Disengage).


*CAUTION:
Use care when removing plugs so that internal parts of valve are not lost.
A
B
C
D (PLUG)
A - PILOT PRESSURE TO DISENGAGE
B - FORWARD SYSTEM PRESSURE
C - PILOT PRESSURE TO ENGAGE
D - REVERSE SYSTEM PRESSURE

With RWD "ON", record pressure readings with machine moving in forward and then reverse. Sluggish (poor) performance of machine may be caused when charge pressure drops below 100 psi; when this happens system pressure is not allowed to increase high enough to keep the machine moving. Refer to figure 1, page 32 for correct range of test pressures.

The probable cause of the charge pressure decreasing below 100 psi is excessive case leakage within the hydrostatic system. This excessive leakage may be caused by either the RWD system or hydrostatic transmission of the machine. The following specifications will determine if the problem is within the RWD system:

Leakage from the wheel motors should not exceed 1.5 gallons per minute (gpm) with the machine moving at system pressure; the E-T II valve leakage should not exceed 1.0 gpm. If excessive leakage exists, refer to section E of this manual for wheel motor service instructions. If leakage is within specification, then components within the hydrostatic transmission of the machine may have excessive leakage; refer to service manual for the machine.

NOTE: For *MUD HOG* systems equipped with motor case flushing lines (refer to page 10 of this manual), the following procedure must be used to perform the leakage test.

1. Disconnect and plug motor case flushing hose where it connects to tube fitting at wheel motor. Cap the tube fitting.

2. Disconnect case drain hose at the E-T II valve, then place end of hose into a suitable container.

3. Allow oil to escape into the container while operating the machine with the *MUD HOG* turned on.

IMPORTANT: ALWAYS KEEP IN MIND CLEANLINESS AND SAFETY

SECTION C: TESTING PROCEDURES

FIGURE 1 TEST PRESSURES VS MACHINE OPERATION MODE

TEST LOCATIONS						
OPERATION MODE	FORWARD PORT	REVERSE PORT	FORWARD LINE	REVERSE LINE	PILOT PRESSURE TO ENGAGE	PILOT PRESSURE TO DISENGAGE
MUD HOG "ON" FORWARD	SYSTEM PRESSURE 1000 TO 6000 PSI	CHARGE PRESSURE 100 TO 300 PSI	SYSTEM PRESSURE 1000 TO 6000 PSI	CHARGE PRESSURE 100 TO 300 PSI	CHARGE PRESSURE 100 TO 300 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI
MUD HOG "ON" NEUTRAL	CHARGE PRESSURE 100 TO 300 PSI	CHARGE PRESSURE 100 TO 300 PSI	CHARGE PRESSURE 100 TO 300 PSI	CHARGE PRESSURE 100 TO 300 PSI	CHARGE PRESSURE 100 TO 300 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI
MUD HOG "ON" REVERSE	CHARGE PRESSURE 100 TO 300 PSI	SYSTEM PRESSURE 1000 TO 6000PSI	CHARGE PRESSURE 100 TO 300 PSI	SYSTEM PRESSURE 1000 TO 6000 PSI	CHARGE PRESSURE 100 TO 300 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI
MUD HOG "OFF" FORWARD	SYSTEM PRESSURE 1000 TO 6000 PSI	CHARGE PRESSURE 100 TO 300 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI	CHARGE PRESSURE 100 TO 300 PSI
MUD HOG "OFF" NEUTRAL	CHARGE PRESSURE 100 TO 300 PSI	CHARGE PRESSURE 100 TO 300 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI	CHARGE PRESSURE 100 TO 300 PSI
MUD HOG "OFF" REVERSE	CHARGE PRESSURE 100 TO 300 PSI	SYSTEM PRESSURE 1000 TO 6000 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI	CASE DRAIN PRESSURE 0 TO 30 PSI	CHARGE PRESSURE 100 TO 300 PSI

TEST PROCEDURE NO. 2

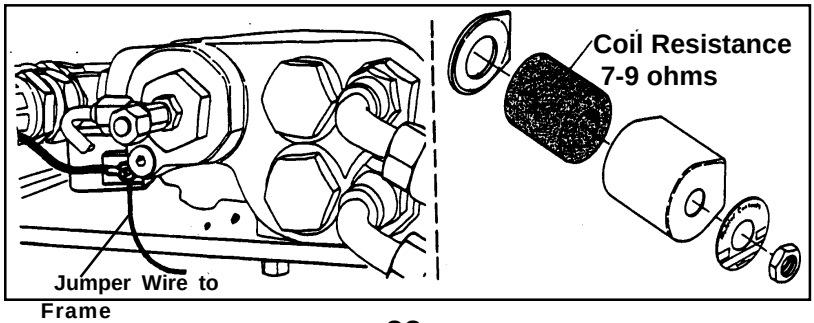
PROBLEM/CAUSE: RWD NOT FUNCTIONING/SOLENOID VALVE NOT WORKING

Turn ignition switch to the "ON" position. Do NOT start engine. Have an assistant operate the ON-OFF RWD switch. A distinct "click" should be heard at the solenoid, indicating that the solenoid valve spool is shifting properly. If click is not heard, check for possible loose wire connections at the screw terminal of the solenoid valve and/or at the RWD switch in the cab.

Also check for improper grounding of solenoid valve. The solenoid valve is internally grounded through the Equa-Trac II valve. Grounding can be tested by using a jumper wire connected to the terminal nut on the solenoid and to the frame of the machine. If solenoid operates properly using the jumper wire, examine the solenoid wire for any signs of breakage, replace if necessary. Check area under heads of bolts securing E-T II valve to bracket, make sure there is a bare metal surface (no paint or grease) to ensure proper grounding.

If click is still not heard, perform an electrical resistance check on the solenoid valve coil to determine if the coil is defective. Coil resistance should be 7-9 ohms.

If the solenoid valve still does not shift after checking for secure wire connections and acceptable coil resistance, replacement of the solenoid valve is necessary. The solenoid valve is not serviceable, thus it must be replaced.



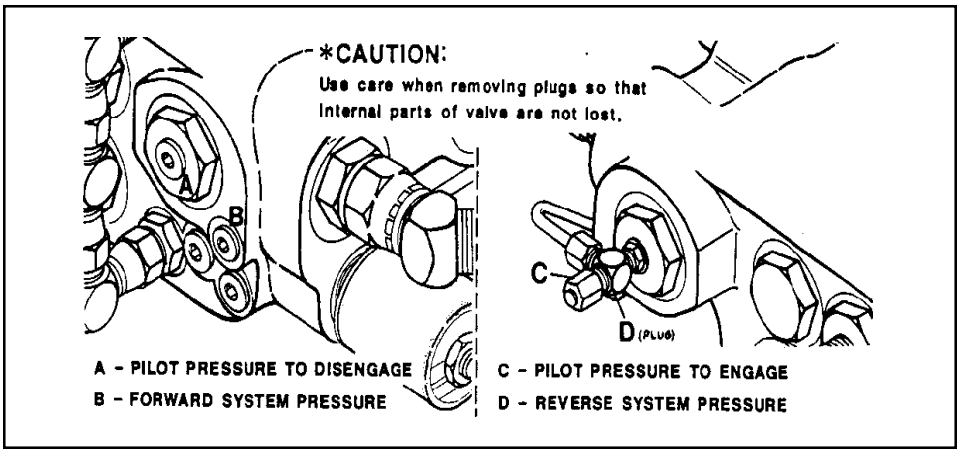
SECTION C

TEST PROCEDURE NO. 3

PROBLEM/CAUSE: RWD NOT FUNCTIONING/MAIN SPOOL NOT SHIFTING

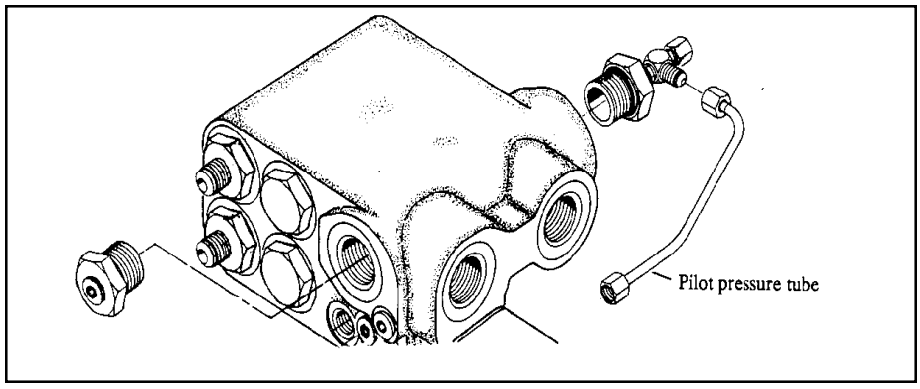
First make sure that the outside of the E-T II valve is free from any dirt or grease. Dirt must NOT be allowed to enter the valve when removing any of the valve components.

Install 7500 psi (or greater) pressure gauges in both forward and reverse test ports, and forward and reverse lines between the E-T II valve and wheel motors. Install 500 psi (or greater) pressure gauges in both pilot pressure ports (Engage and Disengage).

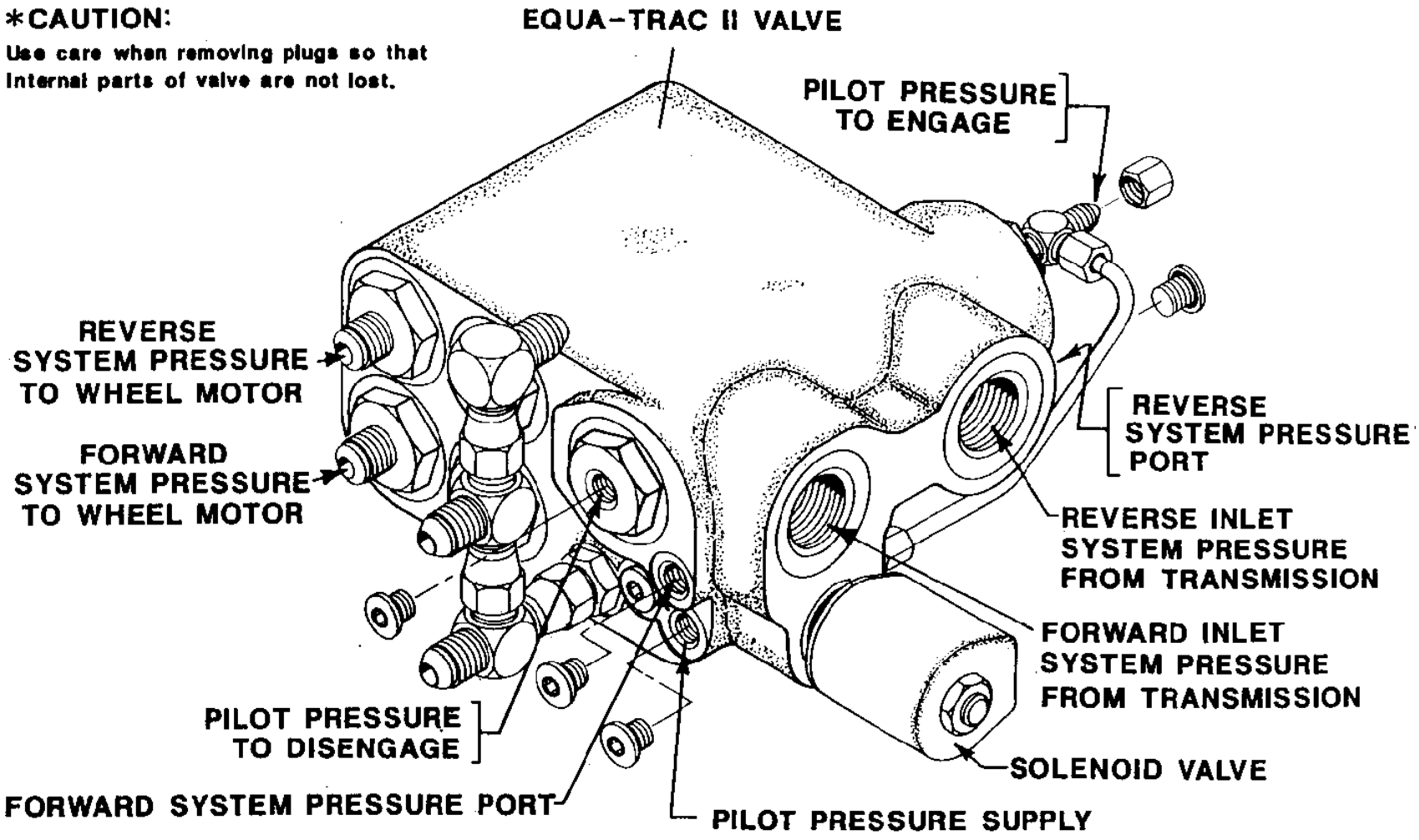

*CAUTION:
Use care when removing plugs so that internal parts of valve are not lost.
A
B
C
D (PLUG)
A - PILOT PRESSURE TO DISENGAGE
B - FORWARD SYSTEM PRESSURE
C - PILOT PRESSURE TO ENGAGE
D - REVERSE SYSTEM PRESSURE

Record pressures with machine moving and with RWD "ON" and then with RWD "OFF". Refer to figure 1, page 32 for correct range of test pressures. If pilot pressure readings are NOT correct, then check solenoid valve to be sure that the valve is shifting properly (see test procedure No. 2). If pilot pressure readings are correct, but forward and reverse line pressures to the wheel motors are NOT correct, then the main spool in the E-T II valve is not shifting.

Remove large hex plug from pilot pressure to disengage port. Disconnect steel tube at the tee fitting on the opposite side of the removed plug. Remove large hex plug and fitting assembly. Check for free movement of the spool in its bore. If spool does not move freely, remove spool from bore and check for excessive wear on the spool and its bore. Reinstall spool in bore and check again for free movement back and forth. If spool continues to stick, then replace the complete E-T II valve assembly.



***CAUTION:**
Use care when removing plugs so that internal parts of valve are not lost.


EQUA-TRAC II VALVE
PILOT PRESSURE TO ENGAGE
REVERSE SYSTEM PRESSURE TO WHEEL MOTOR
FORWARD SYSTEM PRESSURE TO WHEEL MOTOR
REVERSE SYSTEM PRESSURE PORT
REVERSE INLET SYSTEM PRESSURE FROM TRANSMISSION
FORWARD INLET SYSTEM PRESSURE FROM TRANSMISSION
PILOT PRESSURE TO DISENGAGE
SOLENOID VALVE
FORWARD SYSTEM PRESSURE PORT
PILOT PRESSURE SUPPLY

LOCATIONS FOR PRESSURE GAUGE INSTALLATION

START-UP PROCEDURE FOR REAR WHEEL DRIVE SYSTEM

After having completed the installation or servicing of the rear wheel drive system on a hydrostatic drive machine, the following start-up procedure must be performed to insure adequate bleeding and flushing of the newly installed or serviced hydraulic components. This procedure also serves to check proper plumbing of the hydraulic circuit.

IT IS IMPORTANT THAT THESE INSTRUCTIONS BE CARRIED OUT AS SPECIFIED. Any alteration of this procedure will defeat its purpose, which is to bleed air out of the system and flush any possible contamination from the closed loop. Special attention must be given to the 1/2 inch limited movement of the hydrostatic control lever as it is critical not to allow excessive oil flow during this procedure. If any time while performing this procedure a malfunction occurs that causes the hydrostatic system to be reopened, such as disconnecting a hose or fitting, it is necessary to begin the procedure again at STEP 1.

STEPS 1-7 of this procedure are performed with the front drive wheels of the machine on the ground and chocked securely, and the *MUD HOG* RWD axle raised and secured such that the rear wheels remain off the ground with sufficient clearance around the machine. At all times maintain proper fluid level in the hydrostatic reservoir.

STEP	ENGINE SPEED	GEAR SELECTOR	MUD HOG SWITCH	HYDRO LEVER	TIME	COMMENTS
1#	1/2 SPEED	NEUTRAL	ON	NEUTRAL	3 MIN	BLEED AIR ENTIRE SYSTEM
2	HIGH IDLE	NEUTRAL	OFF	1/2 INCH FORWARD	2 MIN	FLUSH FORWARD MAIN SYSTEM
3	HIGH IDLE	NEUTRAL	OFF	1/2 INCH REVERSE	2 MIN	FLUSH REVERSE MAIN SYSTEM
4#	HIGH IDLE	NEUTRAL	ON	1/2 INCH REVERSE	30 SEC MAXIMUM	CHECK CORRECT ROTATION OF MUD HOG *SEE NOTE
NOTE:A) If wheel(s) rotate reverse - go to STEP 6. B) If no rotation - go to STEP 5 (DO NOT repeat - check valve) C) If wrong rotation - correct forward/reverse circuit - to to STEP 1 D) If 2-speed motors - activate displacement control switch - check for change of speed of MUD HOG tires						# On Case 2555 Cotton Pickers, lockout switch must be activated to allow E-T II Valve to be on. This can be done by pushing the wire from the lockout switch toward 1st and 2nd gear.
5*	LOW IDLE	HIGH GEAR HOLD BRAKES	ON	1/2 INCH REVERSE MAXIMUM	15 SEC MAXIMUM	CHECK CORRECT ROTATION OF MUD HOG *SEE NOTE
6*	HIGH IDLE	HIGH GEAR HOLD BRAKES	ON	1/2 INCH FORWARD	4 MIN	FLUSH FORWARD MUD HOG SYSTEM
7*	HIGH IDLE	HIGH GEAR HOLD BRAKES	ON	1/2 INCH REVERSE	4 MIN	FLUSH REVERSE MUD HOG SYSTEM
8*	1/2 SPEED	HIGH GEAR HOLD BRAKES	ON	1/4 INCH FORWARD	15 SEC MAXIMUM	FORWARD PRESSURE CHECK FOR LEAKS
9*	1/2 SPEED	HIGH GEAR HOLD BRAKES	ON	1/4 INCH REVERSE	15 SEC MAXIMUM	REVERSE PRESSURE CHECK FOR LEAKS

***** On Case Rice Combines with System III and Case 2555 Cotton Pickers, place gear selector in 2nd gear, as MUD HOG will not activate in 3rd.

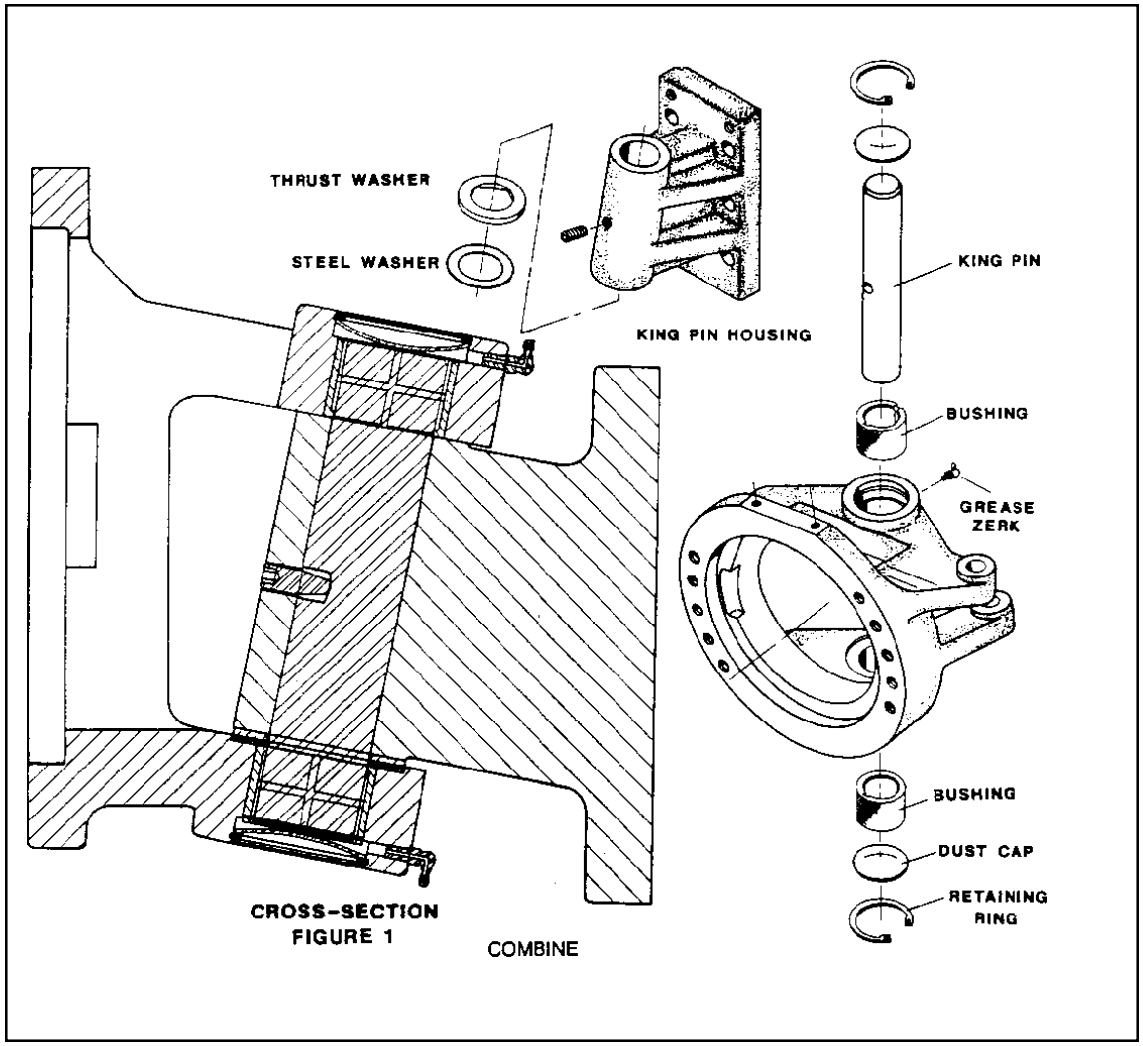
SECTION D: WHEEL DRIVE MAINTENANCE

The wheel motor steerable drive assemblies are designed for a long service life provided that the bushings are periodically greased and the wheel drive units are cleaned on a regular basis. In most cases, complete disassembly of wheel drives for replacement of bushings and thrust washers will not be necessary unless the machine and rear wheel drive axle has logged a considerable amount of field hours and/or has been operated frequently in extremely dusty, sandy or wet/muddy environments without wheel drives being kept clean regularly.

1. BASIC MAINTENANCE REQUIREMENTS

A. EVERY 50 HOURS OF MACHINE OPERATION:

Pump high quality bearing grease into grease zerks installed in wheel motor frames (combines) or stub axle assemblies (cotton pickers). The grease will enter into the inside diameter of the kingpin bushings and grease slots of thrust washer to provide proper lubrication for the steering movement of the wheel motor mount frames. See figure 1 below and figure 2 on page 37.



1. BASIC MAINTENANCE REQUIREMENTS continued:

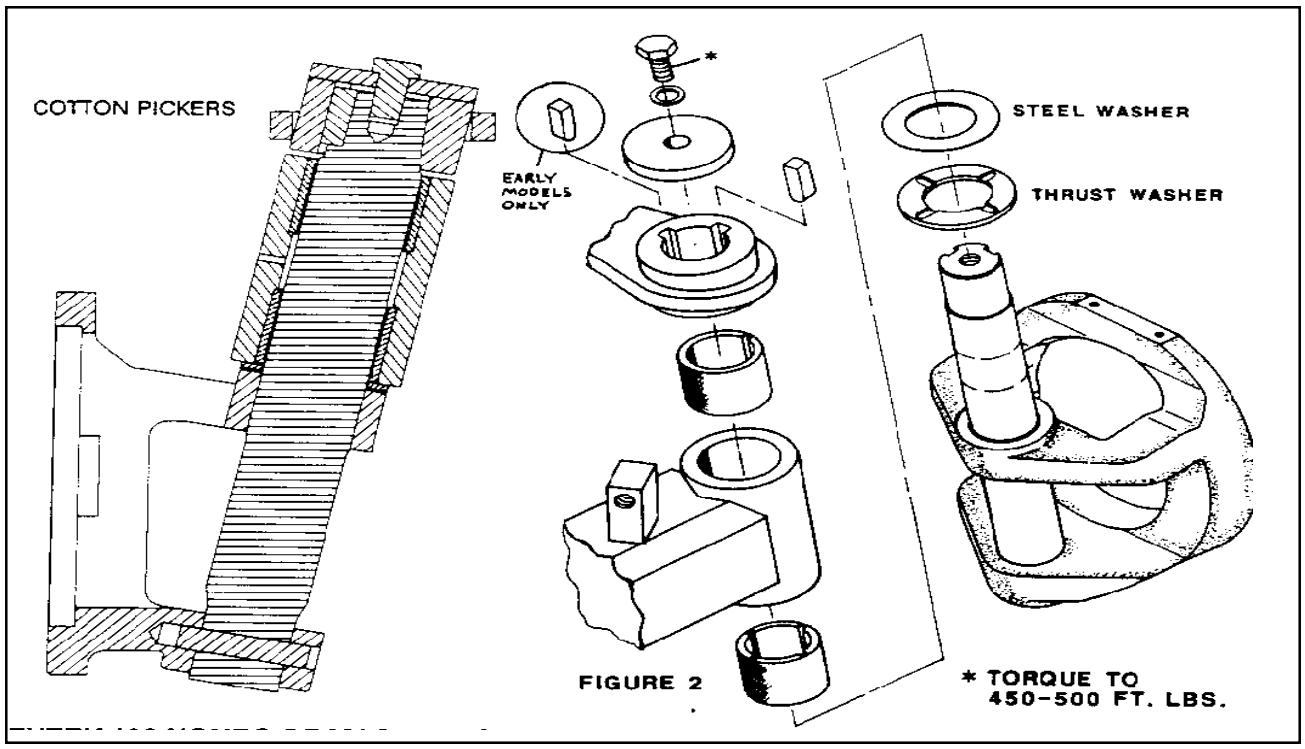


FIGURE 2

B. EVERY 100 HOURS OF MACHINE OPERATION:

Check tightness of wheel drive and wheel motor mounting bolts. For wheel motor mounting bolts, torque to 180-210 ft. lbs. for MS08, ME08 and MS16 motors with ten 5/8" mounting bolts or 300-350 ft. lbs. for MS11 motors with eight 7/8" mounting bolts. Also check tightness of hydraulic tubes at wheel motors. Torque the 3/4" wheel drive mounting bolts to 300-320 ft. lbs. See figure 3 below.

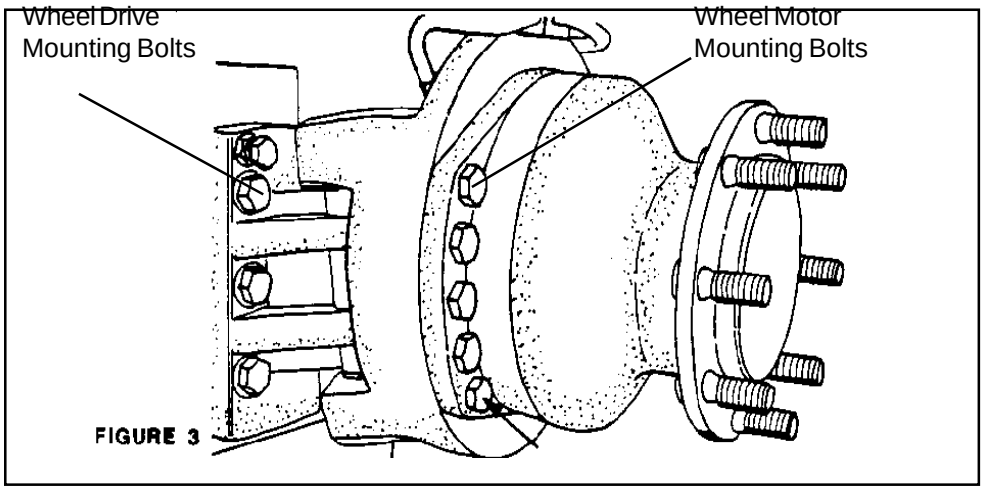


FIGURE 3

NOTE: Wheel drive assemblies should always be cleaned regularly. Any leaks which may occur can be easily found with clean wheel drives.

WHEEL DRIVE MAINTENANCE CONTINUED

1. BASIC MAINTENANCE REQUIREMENTS

EVERY 1500 HOURS OF MACHINE OPERATION:

- **Perform a wear check on the wheel drive bushings and thrust washers.**

COMBINES - Refer to figure 1 on page 36, and figure 4 on page 40.

A. Remove retaining (snap) ring from top of wheel motor frame.

B. Carefully pry out dust cap (expansion plug).
NOTE: If cap is damaged from removal, a new cap will need to be installed.

C. Wipe out grease from top of bushing.

D. Check for excessive or uneven wear on inside diameter of bushing.

E. Repeat procedure a,b,c, and d for lower bushing. If one or both bushings show signs of excessive wear, it is recommended that they be replaced during a complete disassembly ofthe wheel drive. If excessive wear is not present, fill cavities with grease and reinstall dust caps and snap rings.

F. Check for obvious visible wear of thrust washers shown in figure 1 on page 36. Measure thickness of thrust washers, original manufactured thickness is .190" (about 3/16"). If wear amounts to an 1/8" or more, grease slots (machined into washers) are most likely worn down, closing off passages for grease to enter the inside diameter of the bushings. Thrust washers must be replaced. See page 39 for wheel drive disassembly.

COTTON PICKERS - Refer to figure 2 on page 37 and figure 5 on page 42.

A. Disconnect tie rod end from tie rod mounting ear of wheel drive.

B. Support bottom of wheel motor mounting frame using shop crane and lifting sling or chain around wheel drive.

C. Remove 7/8" bolt, 7/8" hardened washer, and retaining cap from tie rod mounting ear on wheel drive. Remove tie rod ear.

D. Carefully lower wheel motor and frame assembly from stub axle end housing (containing bushings).

E. Wipe out grease from inside diameter of bushings. Check for excessive or uneven wear on inside diameters of bushings. Also check for excessive wear on king pin.

F. Remove hardened steel washer and slotted thrust washer. Check condition of thrust washer grease slots and thickness of the thrust washer itself. Proper thickness should be .190" (about3/16").

G. If above checks reveal excessive wear of busings and/or thrust washer, replacement of those parts is necessary. See pages 39 through 43 for wheel drive disassembly procedure.

2. WHEEL DRIVE DISASSEMBLY/ASSEMBLY – COMBINES

DISASSEMBLY – Refer to illustrated parts breakdown on page 40.

A. Raise and support rear of machine using hydraulic jack and support stands.

B. Remove wheel/tire assembly. Disconnect tie rod and steering cylinder and (if necessary) from wheel motor mounting frame ear or bracket.

C. Remove set screw from king pin housing.

D. Remove snap rings, top and bottom and expansion plugs (dust caps), top and bottom from wheel motor mounting frame.

E. Have assistant hold wheel motor mounting frame straight to prevent from turning. Carefully drive king pin out of its housing from the top while mounting frame is being supported.

F. Remove mounting frame from king pin housing. Remove hardened steel washer and grooved thrust washer. Clean grease and/or dirt from mounting frame.

G. Remove king pin bushings from mounting frame by carefully driving them out using a soft metal punch or mandrel. Check mounting frame for cracks.

H. Check condition of king pin for pitting and surface rust, polish if necessary.

ASSEMBLY – Refer to illustrated parts breakdown on page 40.

A. Drive new king pin bushings into wheel motor mounting frame as shown in illustrated parts breakdown, using an appropriately sized mandrel.
NOTE: IT IS VERY IMPORTANT for the bushings to be installed correctly in order for grease to be properly distributed.

B. Grease and position new hardened steel washer and slotted thrust washer onto bottom spot face of mounting frame as shown in illustrated parts breakdown. Use high quality wheel bearing grease.

C. Apply grease to inside surfaces of king pin bushings. Position mounting frame onto king pin housing and have assistant hold in place.

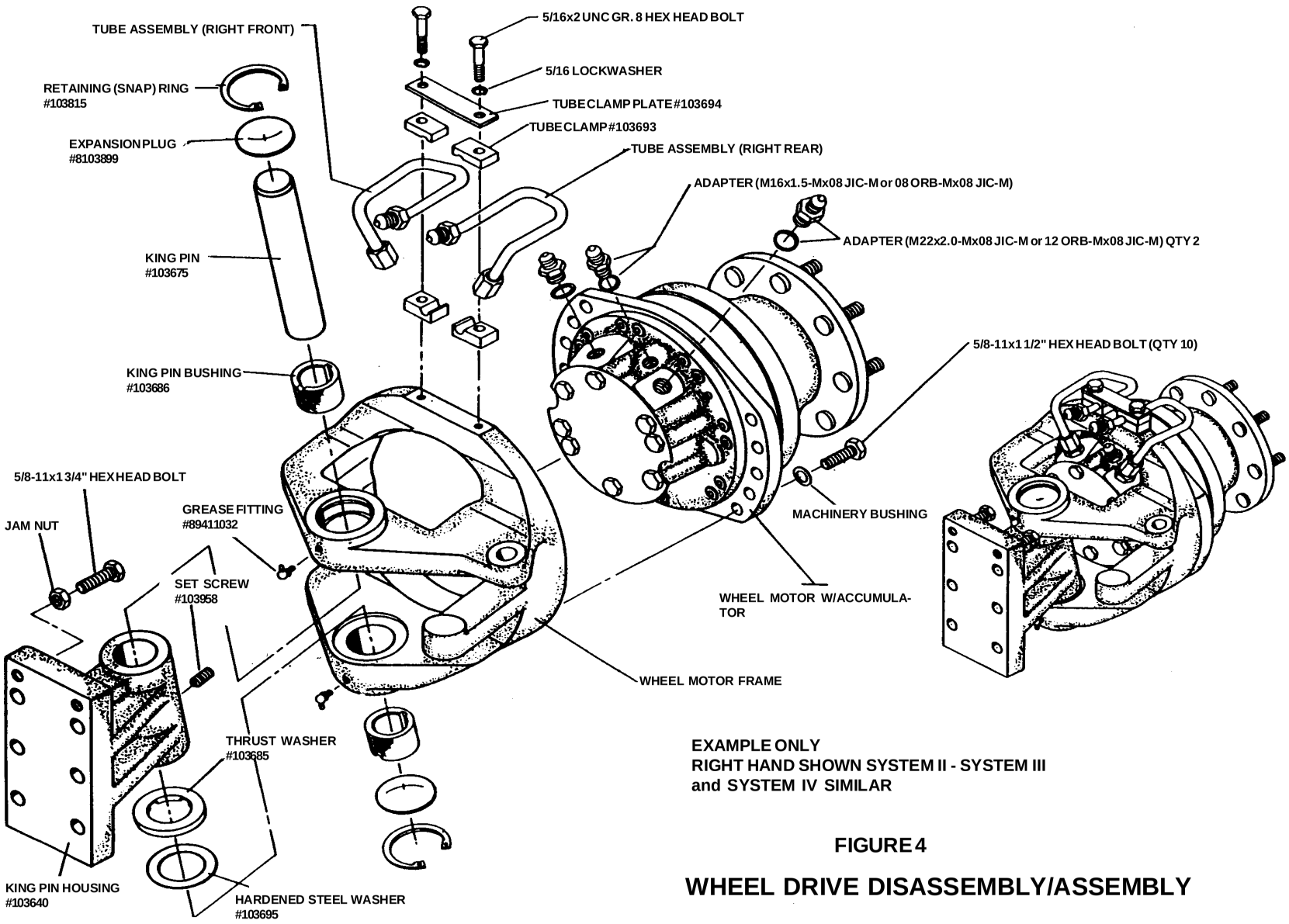
D. Grease king pin and position into top king pin bushing with set screw hole aligned so it will match hole in king pin housing.

E. CAREFULLY drive knig pin into king pin housing until set screw hold in pin aligns with hole in king pin housing.

F. Apply non-permanent locktite to set screw and install into king pin housing.

G. Check movement of wheel motor mounting frame. Frame should pivot smoothly.

H. Install new expansion plugs and snap rings.


TUBE ASSEMBLY (RIGHT FRONT)
5/16x2 UNC GR. 8 HEX HEAD BOLT
5/16 LOCKWASHER
RETAINING (SNAP) RING #103815
TUBE CLAMP PLATE #103694
TUBE CLAMP #103693
EXPANSION PLUG #8103899
TUBE ASSEMBLY (RIGHT REAR)
ADAPTER (M16x1.5-Mx08 JIC-M or 08 ORB-Mx08 JIC-M)
ADAPTER (M22x2.0-Mx08 JIC-M or 12 ORB-Mx08 JIC-M) QTY 2
KING PIN #103675
5/8-11x1 1/2" HEX HEAD BOLT (QTY 10)
KING PIN BUSHING #103686
5/8-11x1 3/4" HEX HEAD BOLT
GREASE FITTING #89411032
JAM NUT
MACHINERY BUSHING
SET SCREW #103958
WHEEL MOTOR W/ACCUMULA-TOR
WHEEL MOTOR FRAME
THRUST WASHER #103685
KING PIN HOUSING #103640
HARDENED STEEL WASHER #103695

EXAMPLE ONLY
RIGHT HAND SHOWN SYSTEM II - SYSTEM III
and SYSTEM IV SIMILAR

FIGURE 4

WHEEL DRIVE DISASSEMBLY/ASSEMBLY

2. WHEEL DRIVE DISASSEMBLY/ASSEMBLY – COMBINES continued:

ASSEMBLY CONTINUED: Refer to illustrated parts breakdown on page 40.

I. Reconnect tie rod and steering cylinder end (if necessary) to wheel motor mounting frame ear or bracket. Use new cotter pins. Torque mounting nuts to proper specifications.

J. Reinstall wheel motor onto mounting frame. Refer to page 106 of this manual. Install mounting bolts using locktite #271 (permanent type) or equivalent. Torque bolts to proper specification.

K. Reconnect hydraulic tubes to wheel motor tube fittings. Refer to page 106.

L. If necessary, pump more grease into upper and lower grease fittings on mounting frame.

M. Reinstall wheel and tire assembly and torque lug nuts to proper specifications.

N. Perform start-up procedure found on page 35 of this manual.

3. WHEEL DRIVE DISASSEMBYL/ASSEMBLY – COTTON PICKERS

DISASSEMBLY – Refer to illustrated parts breakdown on page 42.

A. Raise and support rear of machine using hydraulic jack and support stands. Remove wheel and tire assembly.

B. Disconnect tie rod and steering cylinder end (if necessary) from wheel motor mounting frame ear or tie rod end mounting ear.

C. Support bottom of wheel motor mounting frame using shop crane and lifting sling or chain around wheel drive.

D. Loosen and remove 7/8” bolt, 7/8” hardened washer and retaining cap securing tie rod end mounting ear (bracket) to stub axle assembly. Remove tie rod mounting ear.

E. Carefully lower wheel motor mounting frame from stub axle end housing (containing bushings). Remove hardened steel washer and slotted thrust washer. Check mounting frame for cracks.

F. Remove bushings from axle end housing by carefully driving them out using a soft metal drift or mandrel. Check axle end housing for cracks.

SEE WHEEL DRIVE ASSEMBLY PROCEDURE ON PAGE 43.

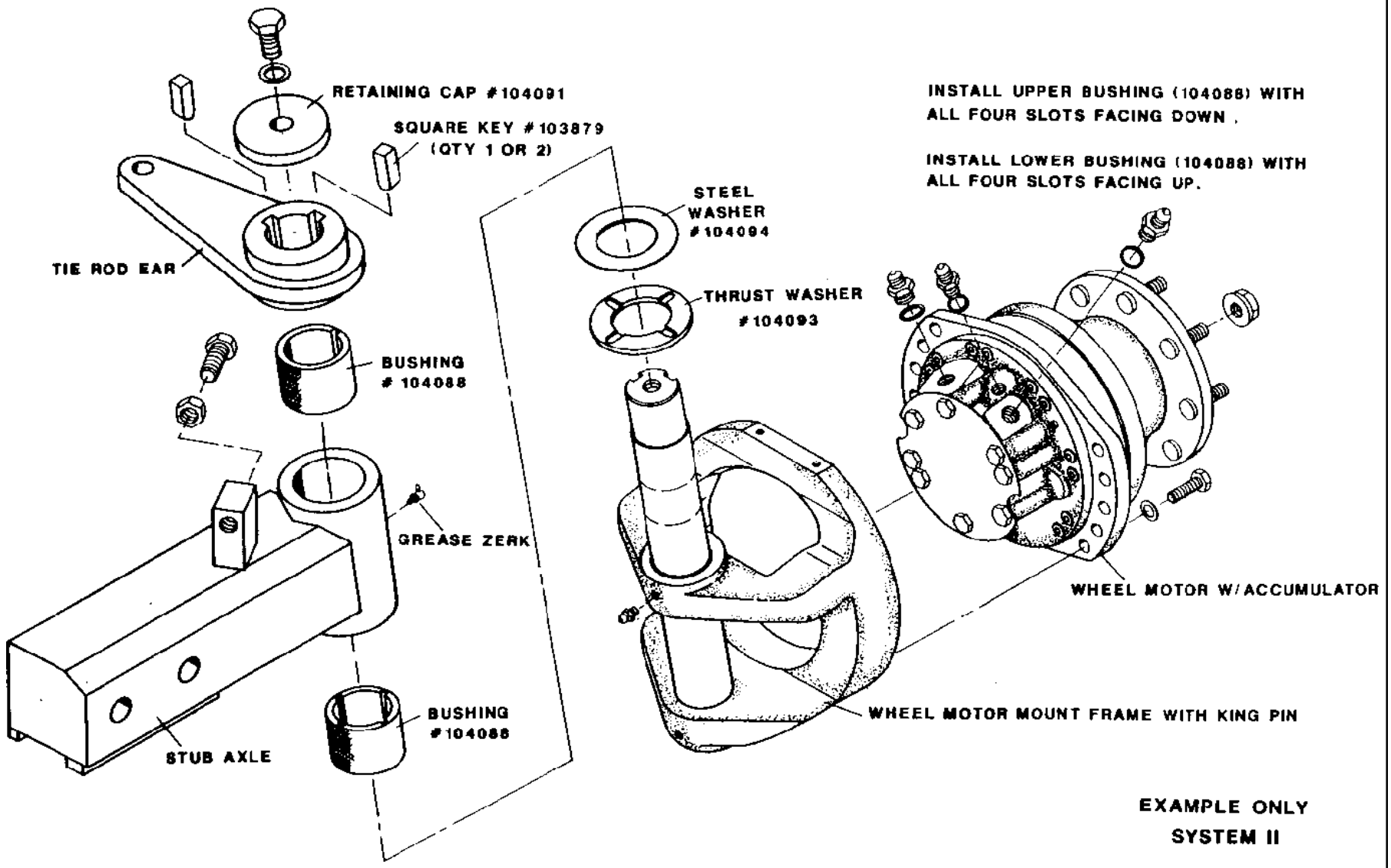


FIGURE 5

WHEEL DRIVE DISASSEMBLY/ASSEMBLY

3. WHEEL DRIVE DISASSEMBLY/ASSEMBLY - COTTON PICKERS continued:

ASSEMBLY - Refer to illustrated parts breakdown on page 42.

A. Drive new king pin bushings into stub axle end housing as shown in illustrated parts break down, using an appropriately sized mandrel.

NOTE: It is very important for the bushings to be installed correctly in order for grease to be properly distributed.

Apply high quality bearing grease around inside diameter of bushings.

B. Grease and position new hardened steel washer and slotted thrust washer on wheel motor mounting frame as shown in illustrated parts breakdown. Use high quality wheel bearing grease.

C. Install king pin and wheel motor mounting frame assembly into axle end housing and support in place.

D. While mounting frame is being supported, install tie rod end mounting ear onto end of king pin using key(s) to secure in proper position. Install retaining cap, 7/8" hardened washer, and 7/8" bolt. Torque bolt to 450-500 ft. lbs. Check for smooth pivoting of mounting frame.

E. Reconnect tie rod, and steering cylinder end (if necessary) to tie rod end mounting ear and/or mounting frame ear. Use new cotter pins. Torque mounting nuts to proper specification.

F. Reinstall wheel motor onto mounting frame. Refer to page 106 of this manual. Be sure to properly torque wheel motor mounting bolts.

G. Reconnect hydraulic hoses to wheel motor tube fittings. Refer to page 106.

H. Reinstall wheel and tire assembly and torque lug nuts to proper specification.

I. Perform start-up procedure found on page 35 of this manual.

SECTION E: WHEEL MOTOR OPERATION AND SERVICE PROCEDURES

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INFORMATION IN THIS SECTION
IS PROPRIETARY PROPERTY OF
TUTHILL DRIVE SYSTEMS

WHEEL MOTOR OPERATION AND SERVICE PROCEDURES

1.01 GENERAL INFORMATION

• DESCRIPTION

The hydraulic wheel motors used on the *MUD HOG* auxiliary drive system are of a cam lobe design which, in general utilize pressurized hydraulic oil to force pistons and their matching rollers against machine-formed lobes to produce mechanical power under full displacement.

The components of the wheel motor that transform hydraulic power (pressure, flow) into mechanical power (torque, rotation) consist of the cylinder block and cam lobe ring.

The cylinder block houses 8 or 10 radially-spaced pistons (and rollers). The block is monted to the splined wheel shaft and is positioned inside the cam ring. The pistons within the cylinder block are fitted with piston rings to ensure high (volumetric) efficiency.

• SERVICE APPLICATION

Refer to page 47 to aid in wheel motor identification.

The service procedures in this section of the manual apply to all available displacements of wheel motors used on the *MUD HOG* auxiliary drive system. Wheel motor displacements are as follows: 48 cubic inch displacement (CID) and 57 CID (System II), 76 CID (System III) and 96 CID (System IV).

The sole difference between the 48 and 57 CID motors (System II) originates with the cam ring. The lobes on the cam ring are machined to achieve the required displacement. Other components within the wheel motors are interchangeable between the 48 and 57 CID wheel motors.

The 76 CID (MS11) wheel motors that are used with System III wheel drive kits are visually larger that the 48 and 57 CID motors. The internal components are similar, but larger in comparison to those in the System II wheel motor and they have the same function. The 76 CID (ME08) wheel motors are the same physical size as the 48 and 57 CID (MS08). The extra displacement is achieved internal to the wheel motor.

The 96 CID (MS16) wheel motors are similar in size to the 48 and 57 CID (MS08) and to the 76 CID (ME08) motors. The only difference in size is the width of the cam ring. The cam ring on a 96 CID motor houses a double row of pistons and thus is wider.

The illustrations used in the service procedures show 48/57 CID System II wheel motors. Due to the similarities of the System III and System IV wheel motors to the System II wheel motors, the service procedures can also be applied to System III and System IV motors except where noted.

1.01 GENERAL INFORMATION

- **DISASSEMBLY**

  The instructions in this procedure are organized in logical sequence to properly disassemble a wheel motor. This is NOT the ONLY sequence that can be used however, certain components must be removed in the sequence indicated.

  Before starting a disassembly procedures, make sure that the work area is clean and safe. A clean work area will reduce the chance of foreign matter entering the hydraulic system as hydraulic lines are disconnected.

  Make sure proper tools are available and are in good working order.

  Label, tag or mark parts as they are removed. Refer to the "exploded" parts illustration of the wheel motor. This will help identify parts that can be involved in a failure and will simplify the assembly procedure.

  Avoid as much dirt as possible DURING disassembly. The accumulation of additional dirt will make it more difficult to clean the parts.

- **REASSEMBLY**

  This procedure assumes that all of the components have been cleaned, inspected and replaced if necessary and are ready to be installed. Torque values for bolts are specified as needed.

  NOTE – Many of the critical parts included in the Tuthill Drive Systems wheel motor are of special design to accommodate the loads and operating requirements of the drive system application on combines and cotton pickers. Make sure any replacement parts are obtained from Tuthill Drive Systems to insure mechanical integrity and proper operation.

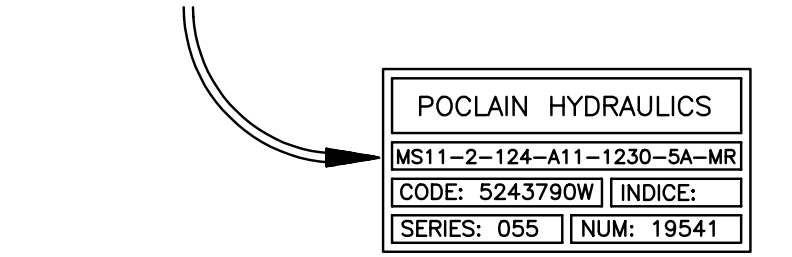
NOTES

WHEEL MOTOR IDENTIFICATION

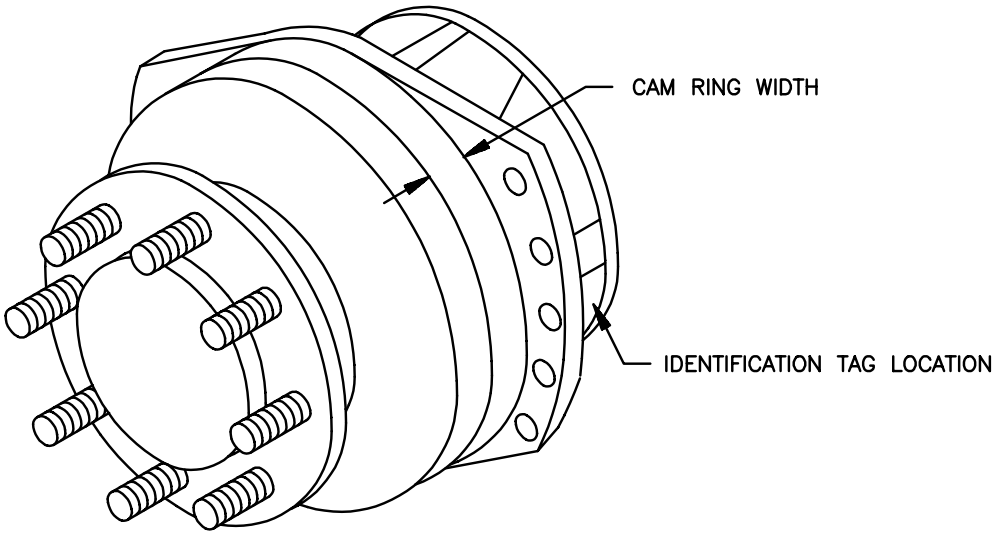
The following will aid you in identifying which wheel motor you have. The wheel motors are all similar in size and shape with the following differences. The MS11 motor is larger than the others and has 10 wheel mounting studs. The MS08, ME08 and MS16 motors have 8 studs. The MS16 motor cam ring is wider than the MS08 or ME08 as shown in the following table. The only way to tell the difference between MS08 and ME08 motors is to look at the identification tag mounted on the valve housing portion of the motor.

The motor may be single speed or two speed, refer to page 61 for identification of the two speed components.

WHEEL MOTOR	FLUIDRIVE SYSTEM	MOTOR CU.IN. DISPLACEMENT	# STUDS	CAM RING WIDTH (IN.)
MS08	II	48 OR 57	8	1 5/16
ME08	III	76	8	1 5/16
MS11	III	76	10	1 3/4
MS16	IV	96	8	2 5/8



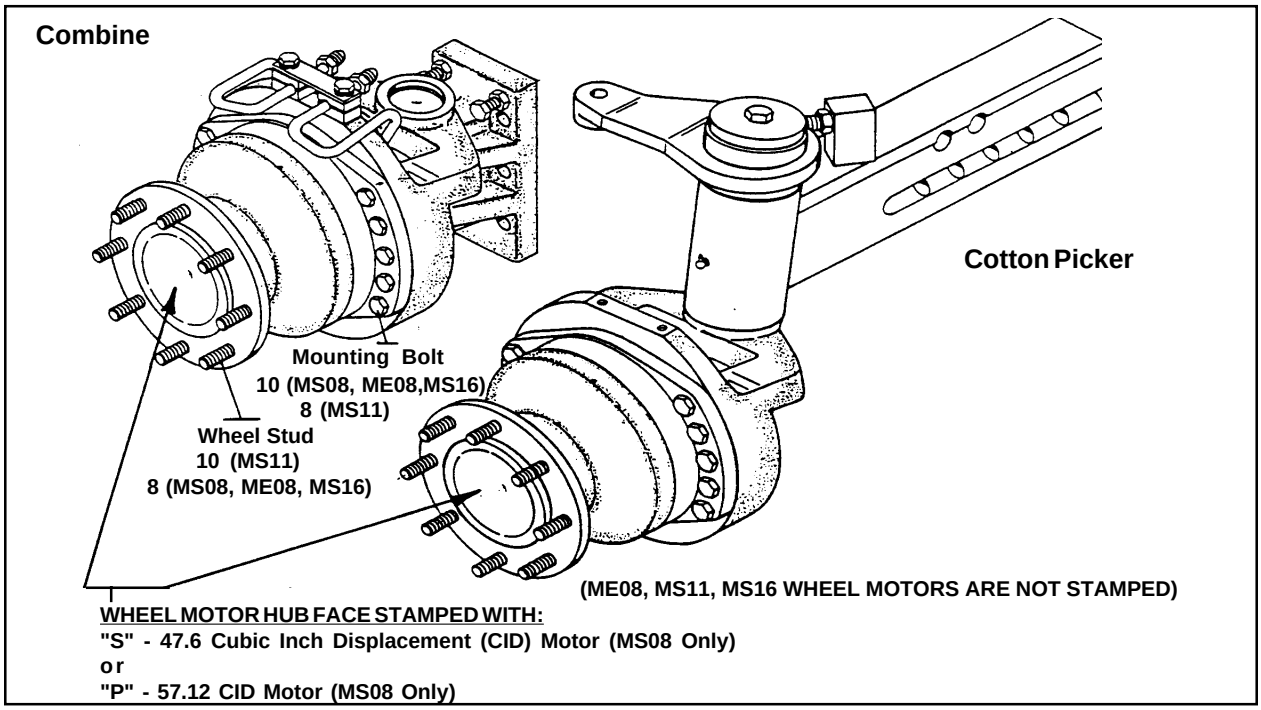
IDENTIFICATION TAG ON WHEEL MOTOR



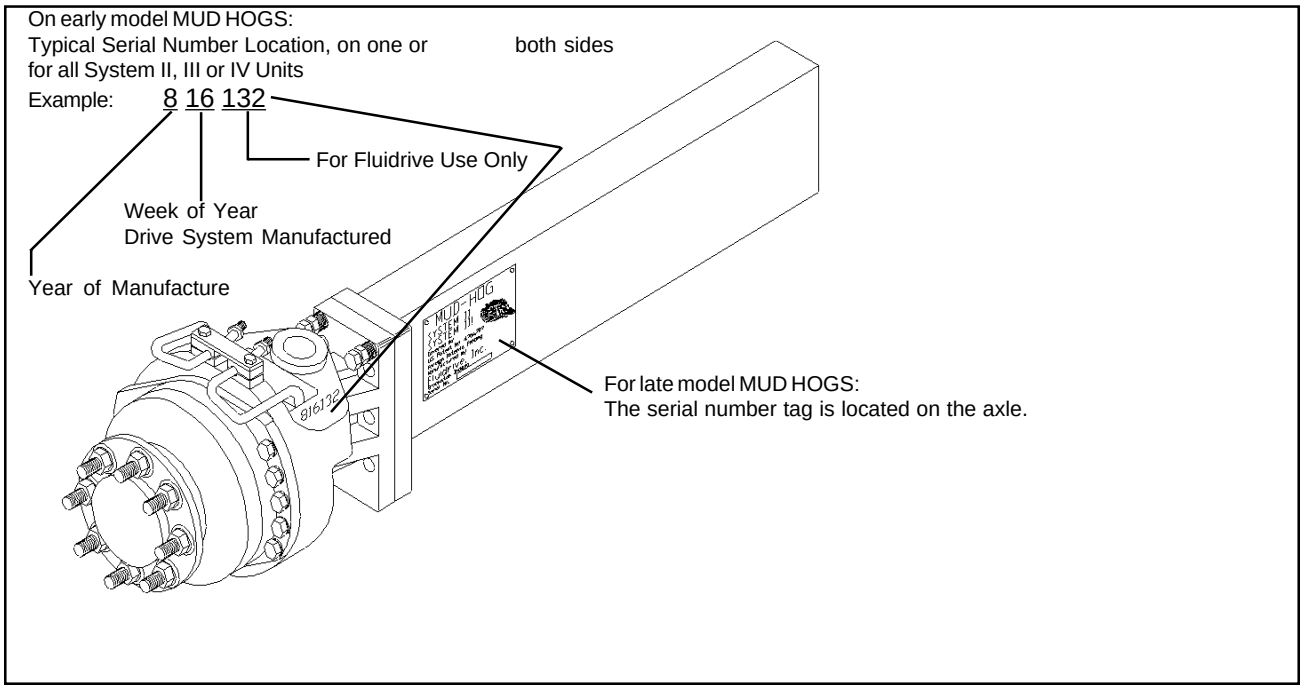
WHEEL MOTOR OPERATION AND SERVICE PROCEDURES

1.02 WHEEL MOTOR IDENTIFICATION

A. WHEEL MOTOR DISPLACEMENT (SIZE) IDENTIFICATION



B. WHEEL MOTOR/DRIVE SYSTEM SERIAL NUMBER (STAMPED)


On early model MUD HOGS:
Typical Serial Number Location, on one or both sides
for all System II, III or IV Units
Example: 8 16 132
For Fluidrive Use Only
Week of Year
Drive System Manufactured
Year of Manufacture
MUD-HOG
SYSTEM III
816132
For late model MUD HOGS:
The serial number tag is located on the axle.

Note: When ordering service parts, supply Tuthill Transport Technologies with information from both the above items.

WHEEL MOTOR OPERATION AND SERVICE PROCEDURES

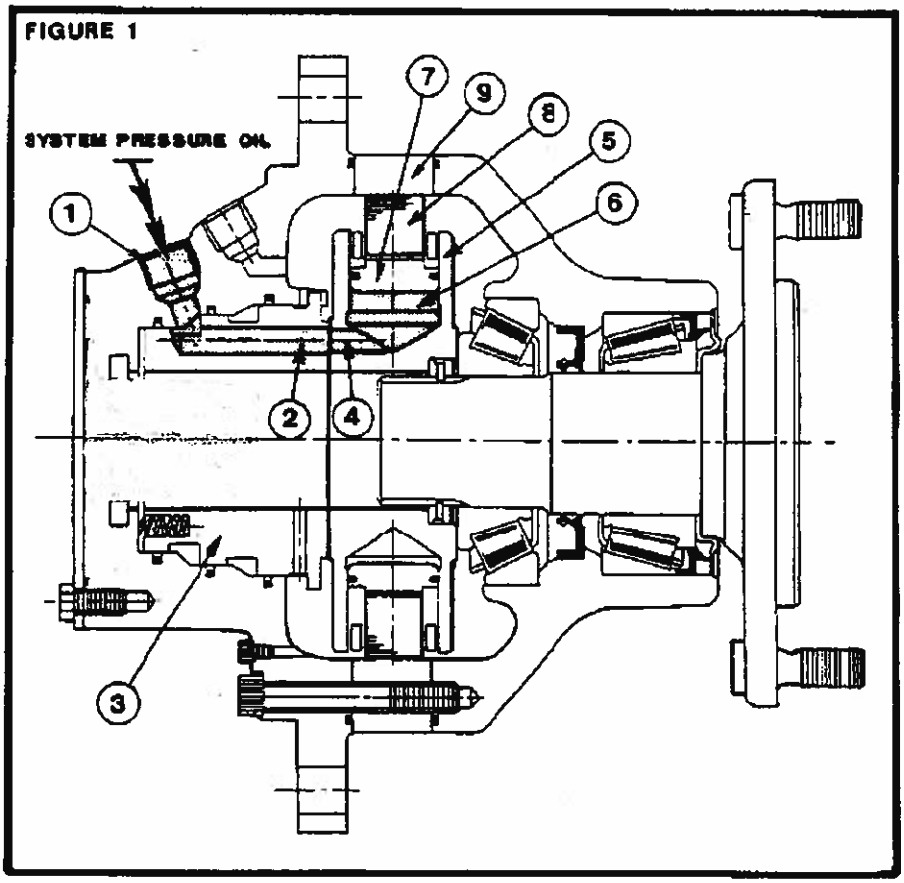
1.03 WHEEL MOTOR OPERATION

• Operating Principle (Path of One Piston)

A. INITIAL SUPPLY POSITION (DRIVE SYSTEM ENGAGED)

Refer to figure 1.
To start the drive cycle, hydraulic oil under high system pressure (up to 5500-6000psi) is delivered from the main hydrostatic pump and is directed through the Equa-Trac II valve, then supplied equally to the high pressure ports (1) at the wheel motors. The oil is diverted through a port (passage) (2) in the distributor (3) and a port (4) in the cylinder block (5), which are partially aligned (also see figure 1-6), allowing oil to begin entering the cylinder cavity (6) behind the piston (7). The high pressure oil pushes the piston outward causing the roller (8) to make contact with the cam lobe (9) just after the peak (highest point) of the lobe. This contact causes the cylinder block (5) to start rotating.

FIGURE 1

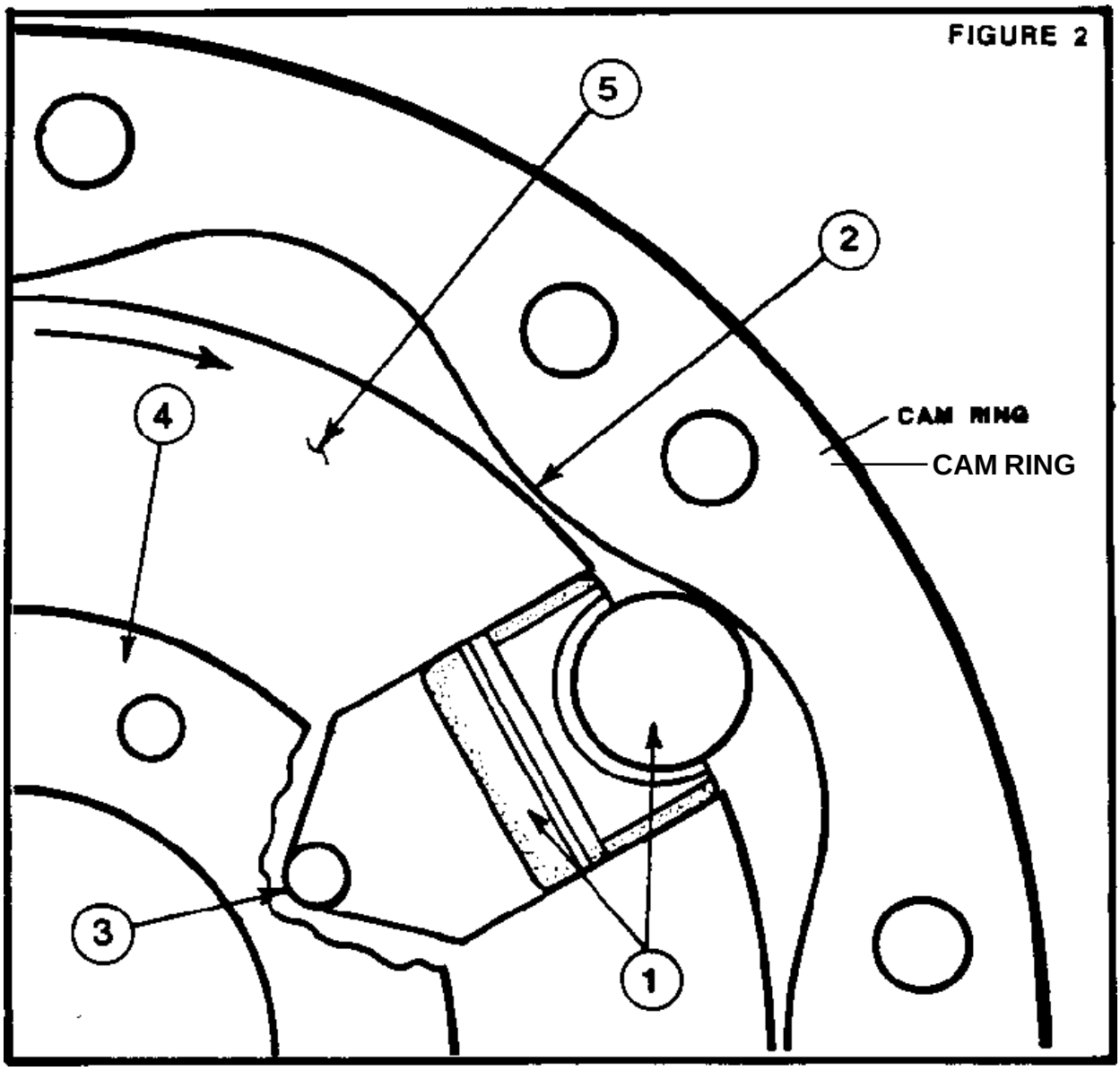


1.03 WHEEL MOTOR OPERATION

- **Operating Principle (Path of One Piston)**

B. FULL SUPPLY POSITION

Refer to figure 2.
As the piston (and roller) (1) makes its way toward the bottom (valley) of the cam lobe (2), the MAXIMUM (full) supply of high pressure hydraulic oil momentarily is directed through the aligned ports (3) of the distributor (4) (remaining stationary) and cylinder block (5) (rotating), with continuation on to the piston (1). The oil supply then begins to taper off as the piston approaches the bottom of the cam lobe (2) toward a neutral (no drive power) position.



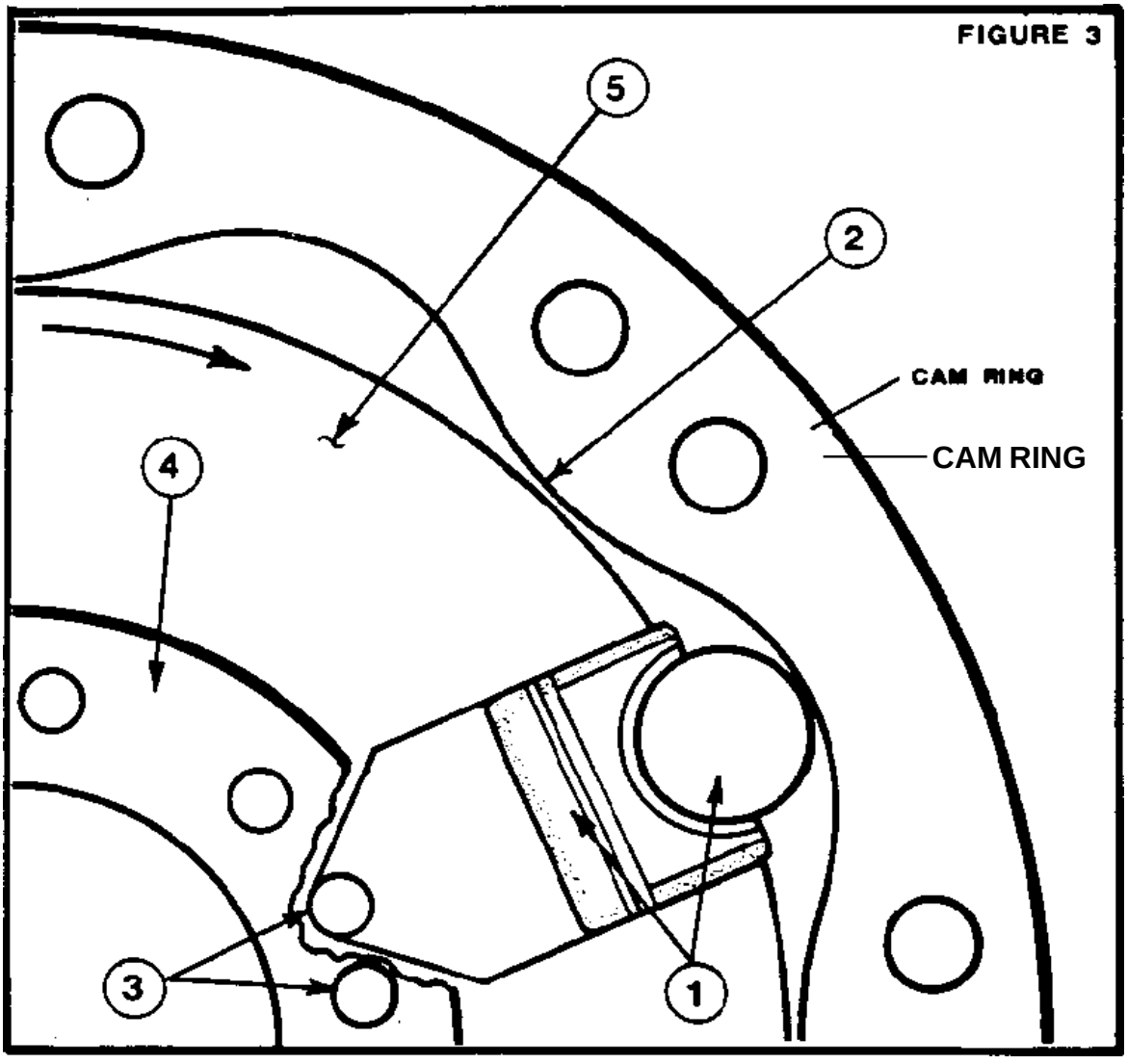
1.03 WHEEL MOTOR OPERATION

• Operating Principle (Path of One Piston)

C. BOTTOM NEUTRAL POSITION

Refer to figure 3.
When the piston (1) is at the bottom of the cam lobe (2), the oil supply is cut off. The ports (3) in the distributor (4) and cylinder block (5) are NOT in alignment with each other. In this neutral position the piston does NOT provide drive power to the cylinder block, however, the piston (and roller) remains in contact with the cam surface.

In order to continue driving power, another piston must take over for the first one to drive the cylinder block in the direction shown, enabling the first piston to climb the next cam lobe in a smooth and uninterrupted manner.



1.03 WHEEL MOTOR OPERATION

• Operating Principle (Path of One Piston)

D. DISCHARGE POSITION

Refer to figure 4.
As the piston (1) starts to climb the next cam lobe (2), ports (passages) (3) in the distributor (4) and cylinder block (5) begin to align with each other, thus starting the discharge cycle. This allows the hydraulic oil (under charge pressure) to return to the pump as another piston takes over to continue the drive cycle.

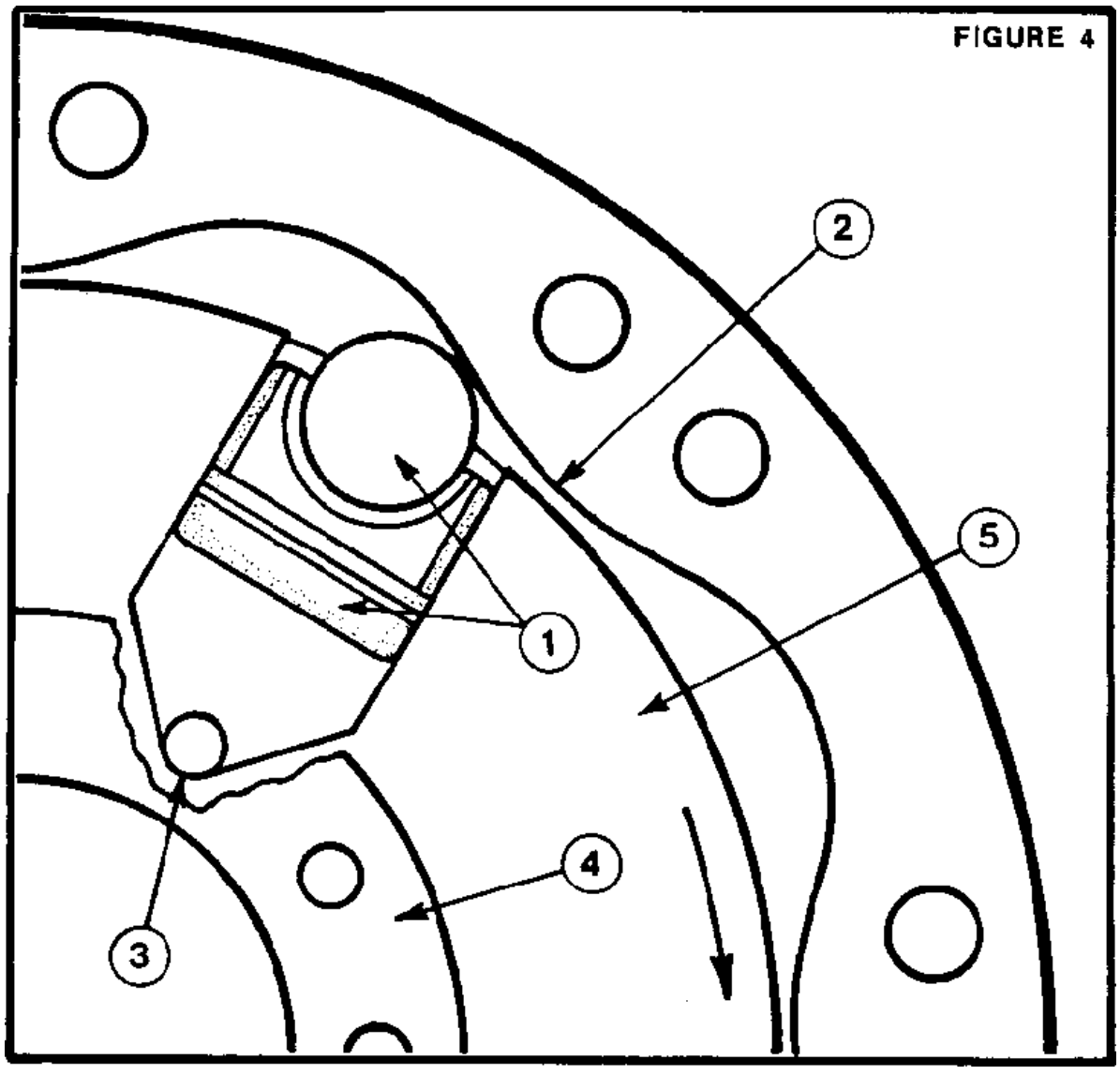


FIGURE 4

1.03 WHEEL MOTOR OPERATION

- **Operating Principle (Path of One Piston)**

E. TOP NEUTRAL POSITION

Refer to figure 5.
During the final cycle of the piston (1), the piston continues to climb another cam lobe (2). As this happens, ports (3) in the distributor (4) and cylinder block (5) progressively close off return oil flow as the piston (and roller) reaches the top (neutral) position.

When the roller is at the top of the cam lobe, the ports are no longer in alignment, thus ending a full drive cycle. The piston and its roller will then repeat the cycle starting with a gradual supply of high pressure oil, while other pistons continue their cycles in a similar manner.

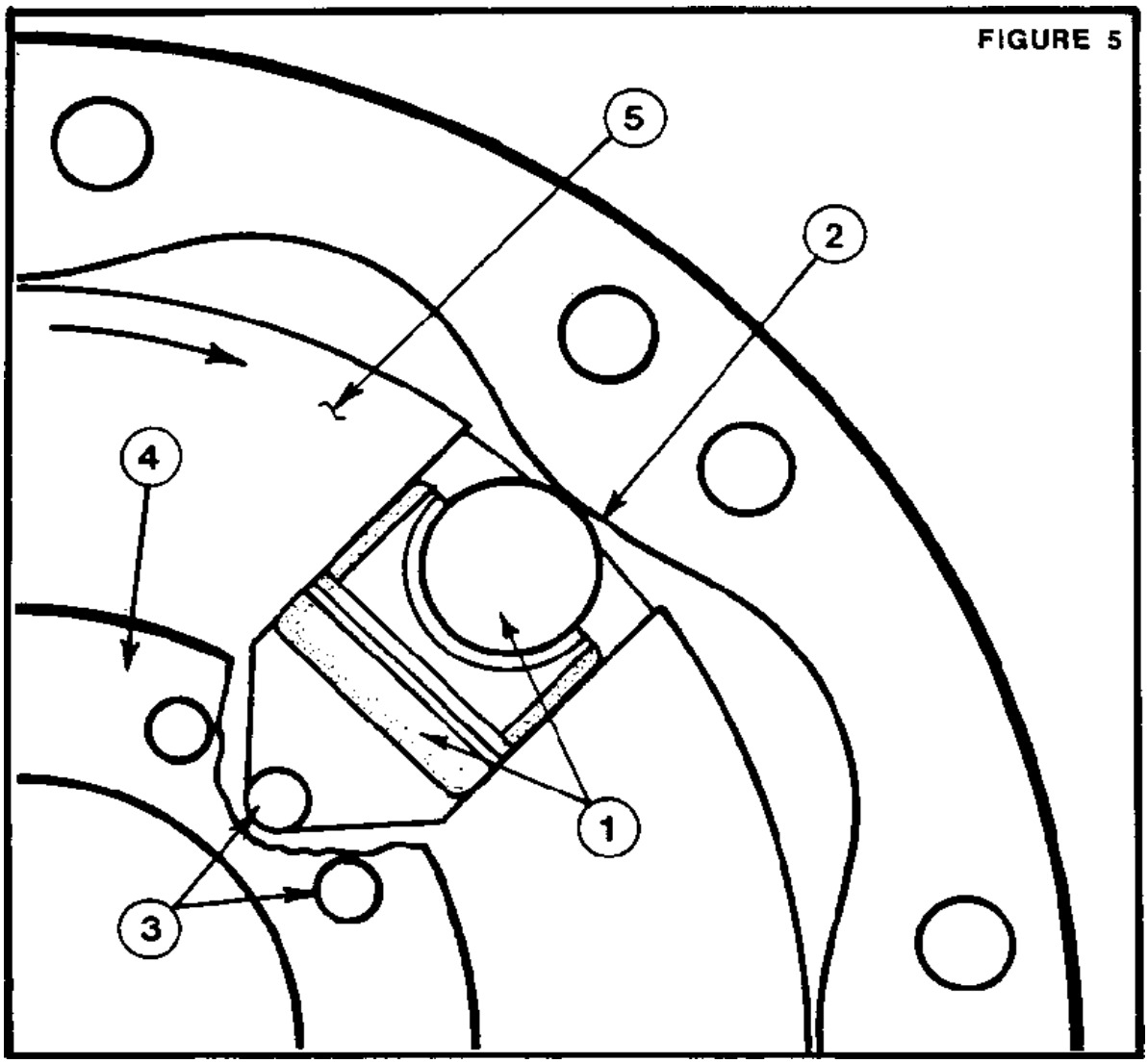


FIGURE 5

1.03 WHEEL MOTOR OPERATION

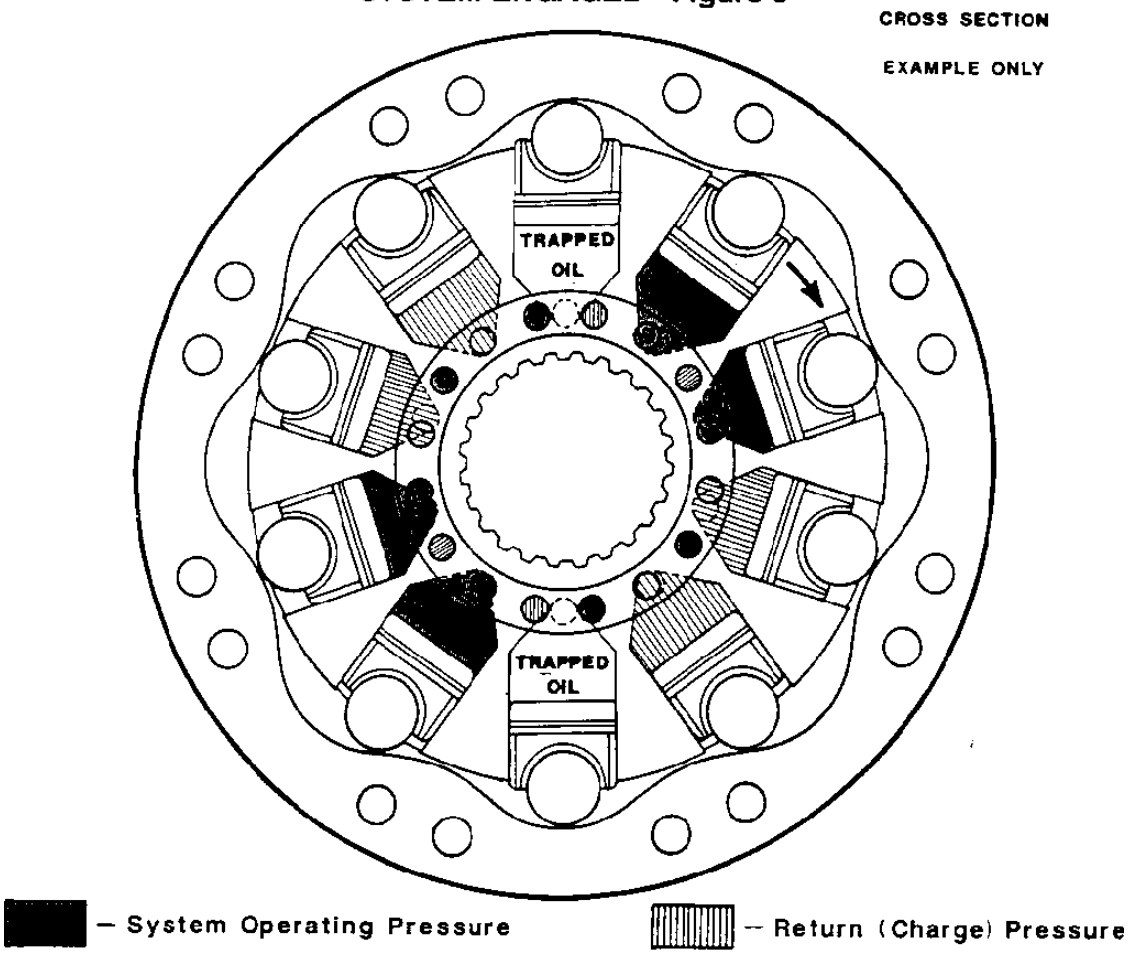
• Operating Principle (Drive System Engaged)

F. WHEEL MOTOR POWER DISTRIBUTION (Engaged)

The typical System II (48 or 57 CID) wheel motor contains ten pistons and eight cam lobes, therefore a total of 80 power strokes are produced by the pistons in one revolution of the cylinder block (splined to the wheel shaft). A 76 CID wheel motor (System III) contains eight pistons and six cam lobes for a total of 48 power strokes by the pistons in one revolution of its cylinder block. Each piston (and roller) travels up and down each of the eight cam lobes in a smooth, uninterrupted manner, producing a constant torque output with a low noise level. With an even number of pistons and cam lobes, the internal forces of the motor are balanced allowing the motor bearings to be totally available to accept high radial and axial loads.

To change the direction of rotation of the motor, the input supply of high pressure oil is directed through the reverse high pressure port and is diverted through the distributor of the motor in a manner opposite that of the forward rotation of the motor.

SYSTEM ENGAGED - Figure 6



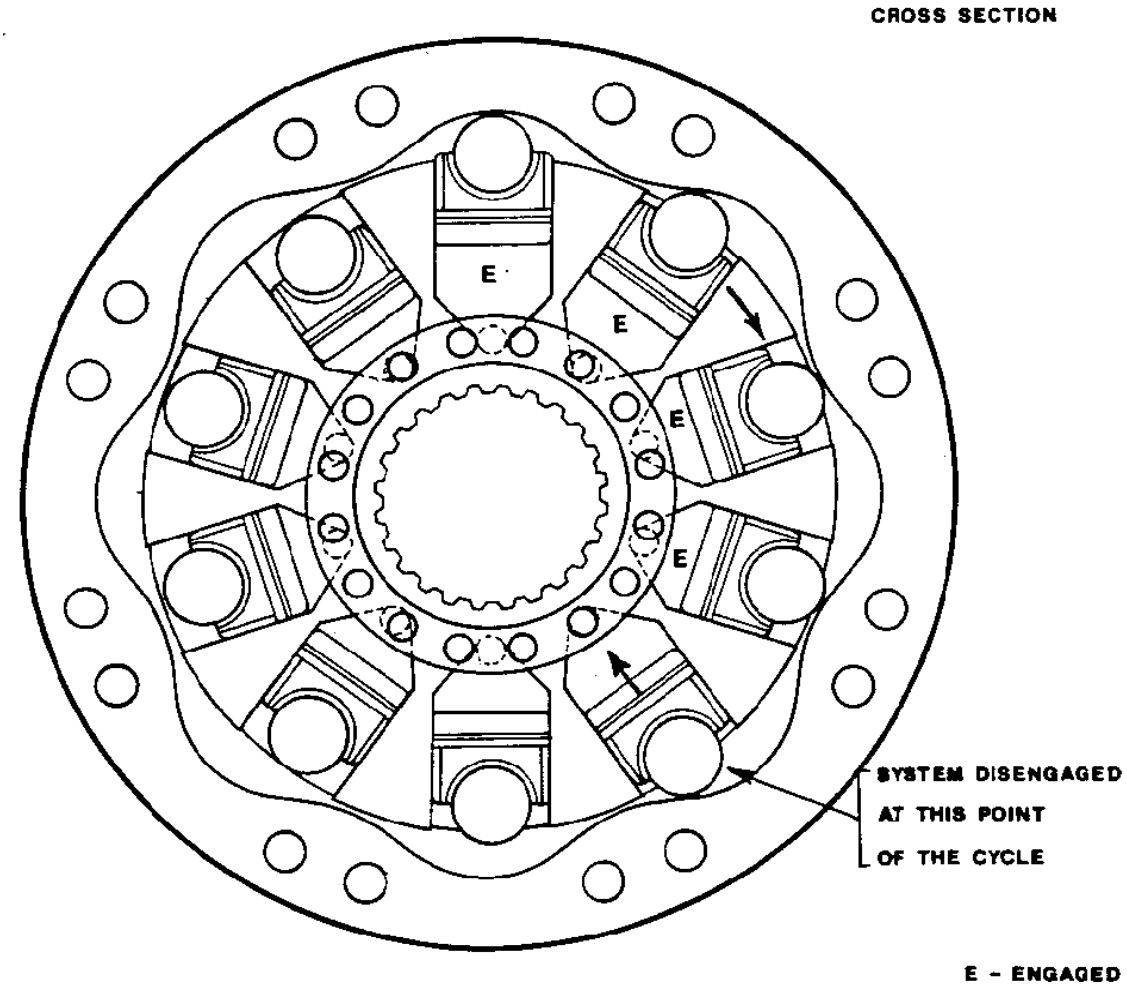
1.03 WHEEL MOTOR OPERATION

• Operating Principle (Drive System Disengaged)

G. WHEEL MOTOR POWER DISTRIBUTION (Disengaged)

When the drive system is shut off (disengaged), the Equa-Trac II valve prevents high system pressure oil from being supplied to the wheel motors. To accomplish this, charge pressure from the return side of the hydrostatic system is directed through the valve to move the directional control spool, within the valve, to block off oil flow passages to the motors. In addition, oil flow in system pressure supply lines from the valve to the motors is routed directly to the reservoir through the valve, so that any pressure in these lines is dissipated. The lack of pressure on either side of the pistons enables the pistons (and rollers) to retract into their cylinder bores when the rollers are pushed inward by the cam lobes, as the cylinder block rotates. With the rollers clear of the cam lobes, the cylinder block and wheel shaft are able to rotate in a "Free-Wheeling" (NON DRIVE) manner.

SYSTEM DISENGAGED - Figure 7



WHEEL MOTOR OPERATION AND SERVICE PROCEDURES

1.04 MOTOR PROBLEM DIAGNOSIS/TROUBLESHOOTING

COMMON PROBLEMS

PROBLEM	CAUSE	REMEDY
A) MOTOR DOES NOT ROTATE OR ROTATES SLUGGISHLY	NO PRESSURE - Equa-Trac II valve damaged.	Service or replace Equa-Trac II valve
	EXCESSIVE INTERNAL LEAKAGE - Check condition of cylinder block assembly and distributor.	See subsections - 1.07-3 and 1.07-4.
B) EXTERNAL OIL LEAKS	MOTOR CASE PRESSURE TOO HIGH - Check to make sure that case drain lines to motors and drain line to reservoir are NOT blocked, pinched or kinked.	
	Seals within motor damaged by pressure spikes, elevated operating temperature, use of fluid not approved for contaminants in oil.	See section 1.06 and subjection 1.07-2.
	Wheel motor incorrectly assembled or defective.	See section 1.07.

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WHEEL MOTOR OPERATION AND SERVICE PROCEDURES

1.06 MOTOR REMOVAL FROM MACHINE

NOTE - The procedures given in this subsection are for combine applications, however, motor removal procedures for cotton pickers are similar.

A) Park machine in an area equipped for drainage. Wash off heavy dirt and remove excess grease from exterior of wheel motor and motor mounting frame.

B) Move machine to a clean work area. Apply "PARK or EMERGENCY BRAKE" and block front wheels to prevent machine from rolling. Using a suitable lifting device, such as a mobile shop crane or floor jack, raise rear of machine so that rear tires are several inches off the ground. Place jack stands securely under rear frame of machine. DO NOT support machine under axle center section. Center section can be supported to prevent pivoting.

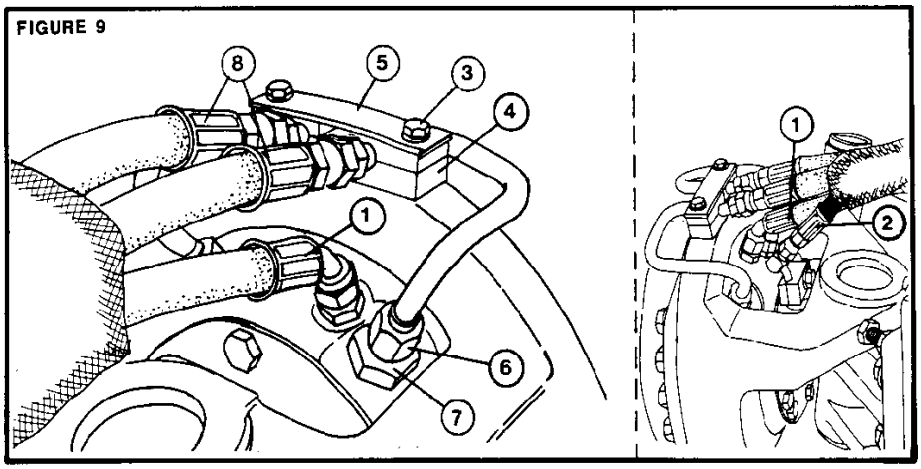
NOTE - It is recommended that one wheel motor be removed and serviced at a time. Cleanliness is most important in servicing the motor. Always use clean tools and keep opened surfaces free of dirt.

C) Refer to figure 9.
Remove wheel and tire assembly from motor shaft hub. Disconnect and plug case drain hose (1) and motor case flushing system supply hose (2) (if equipped) at wheel drive (see note below), mark hoses for proper reconection later.

D) Refer to figure 9.
Remove bolts (3) securing tube clamps (4) to wheel motor mounting frame, then lift off clamp plate (5) and top clamp halves. Loosen tube nuts (6) connecting high pressure tubes to each wheel motor fitting (7) and disconnect tubes from fittings. Plug each tube, but do not disconnect high pressure hoses (8). Temporarily secure tubes away from wheel motor. Cap fittings on wheel motor to prevent damage to fittings when removing motor from mounting frame and also to keep contamination out of motor.

NOTE - If motor case drain hose (1) and case flushing supply hose (2) are NOT plugged when disconnected, oil from reservoir will drain from hose end.

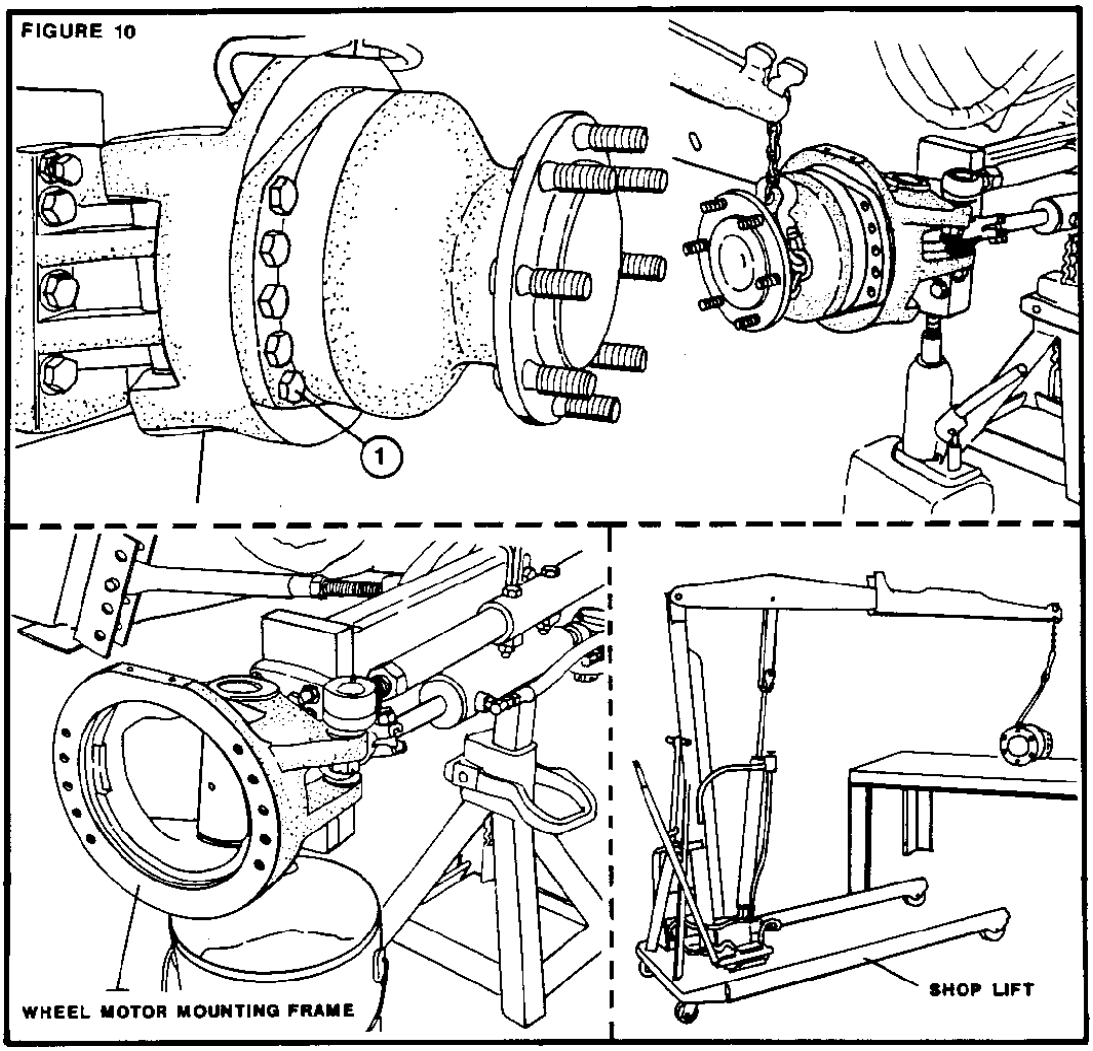
FIGURE 9



1.06 MOTOR REMOVAL FROM MACHINE

E) Refer to figure 10.
Using a floor jack or lifting device of adequate capacity, support wheel motor while removing wheel motor mounting bolts and machinery bushings (1). CAREFULLY remove motor and move it to a suitable work bench.

CAUTION - The wheel motor is very heavy (127 lbs - MS08 &ME08, 185 lbs - MS11). Use extreme care when removing and handling motor to prevent personal injury and damage to wheel motor and fittings.



WHEEL MOTOR OPERATION AND SERVICE PROCEDURES

1.07 SERVICE PROCEDURES

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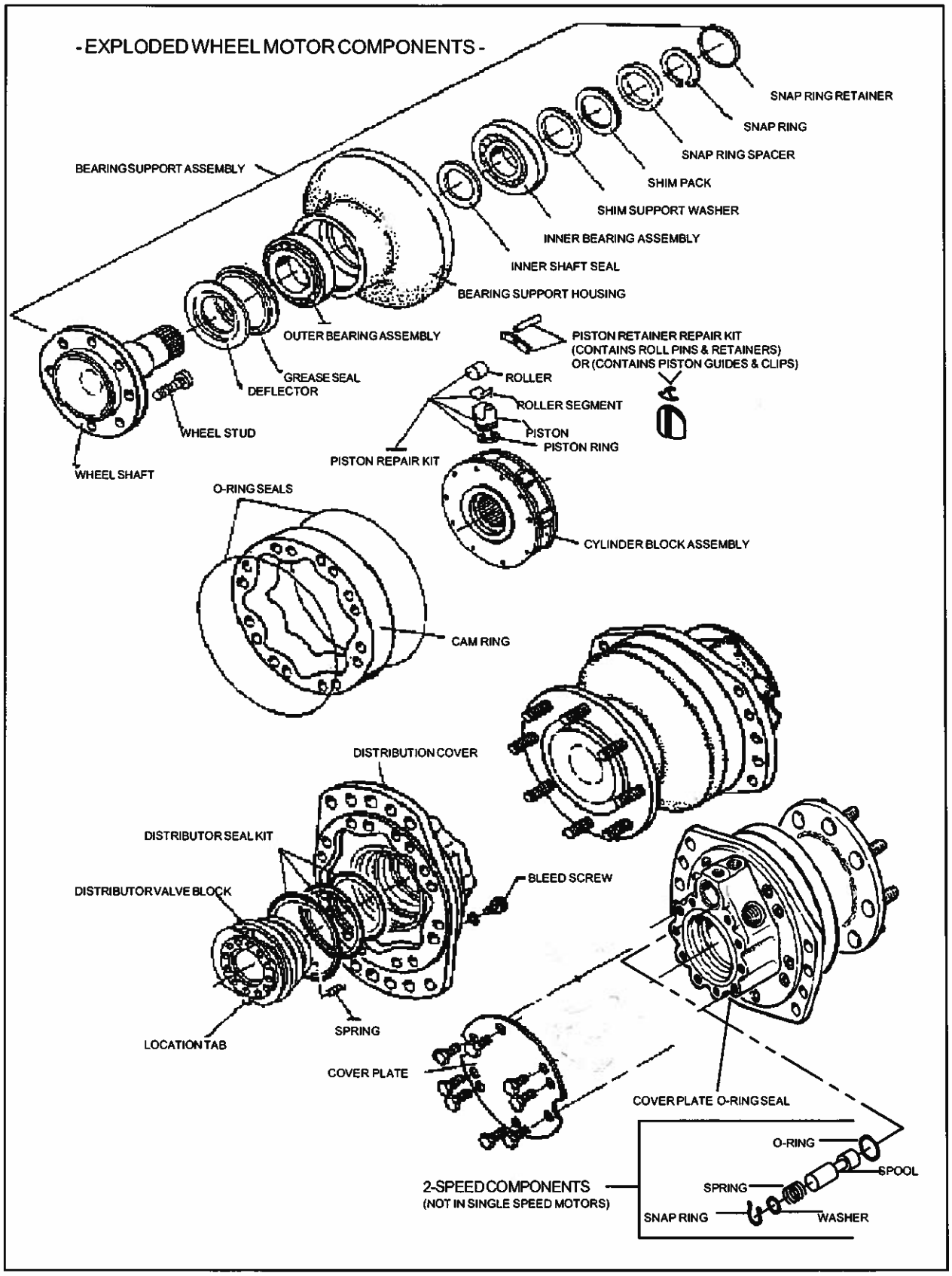
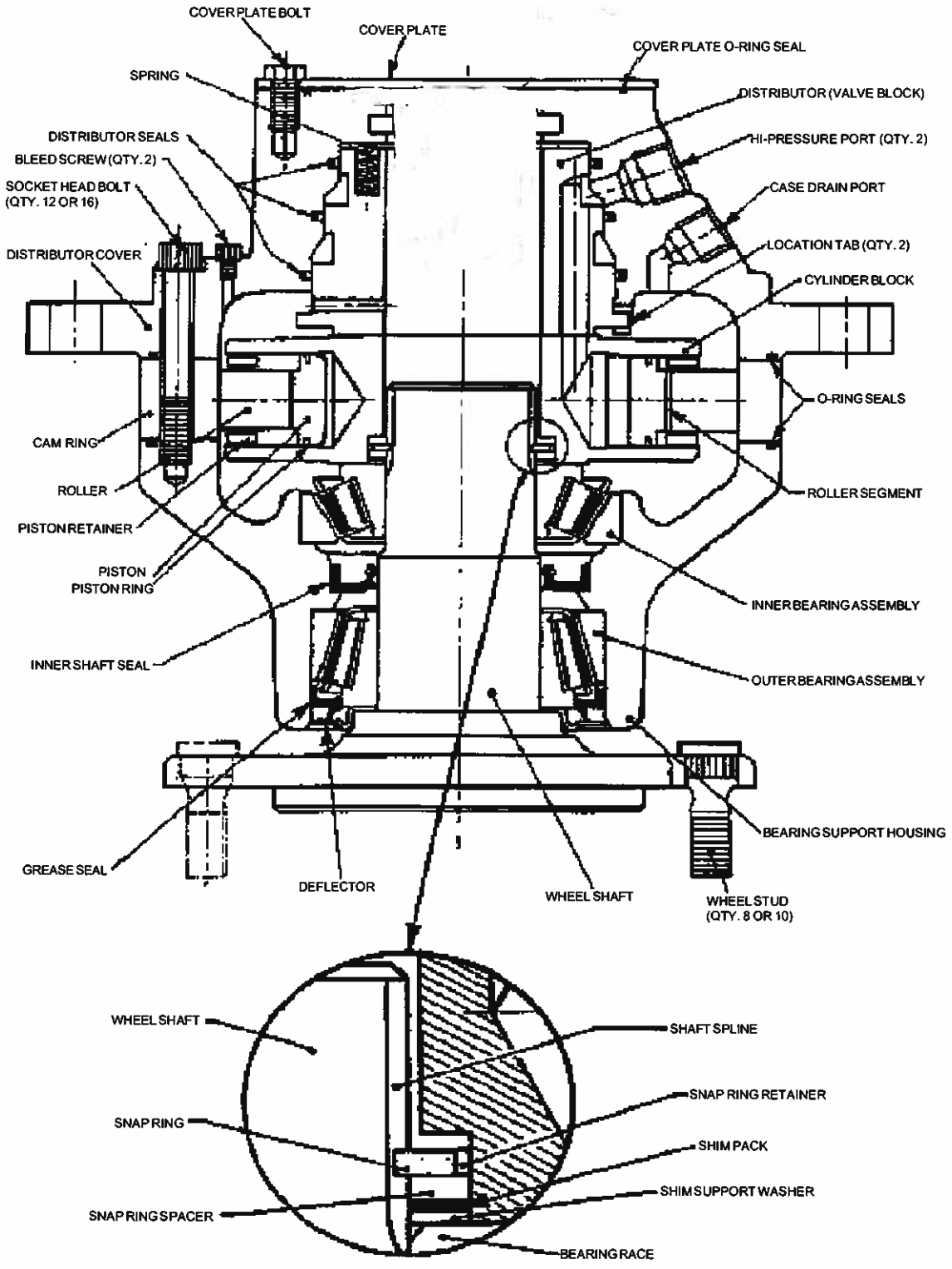


1.07-1 COMPONENT ILLUSTRATIONS

- WHEEL MOTOR CROSS SECTION -



1.07 SERVICE PROCEDURES

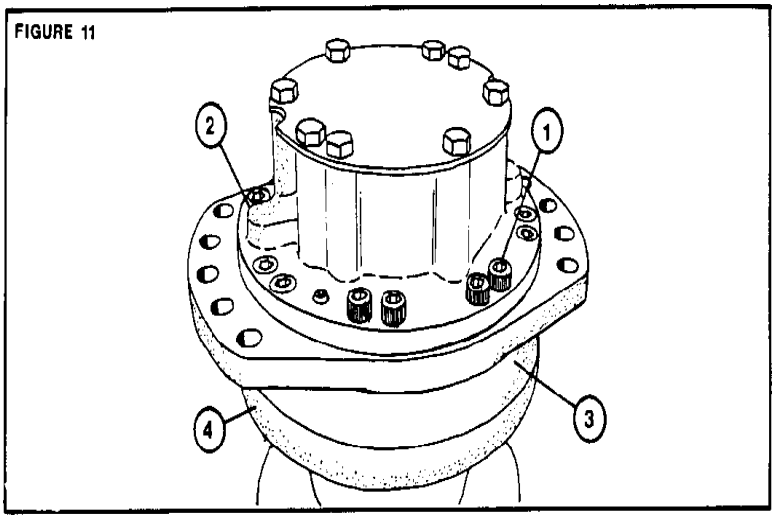
DISASSEMBLY

Shaft/Grease Seals and Bearings (1.07-2)

NOTE - Replacement of the inner shaft seal and/or outer grease seal requires replacement of large o-ring seals. Replacement of the bearings requires replacement of the inner shaft seal, outer grease seal, the deflector and adjustment of the bearings. Replacement of the adjusting shims may be required in the above listed situations.

A) Refer to figure 11 and to component illustration of page 62.
Remove 14 or 10 (of 16 or 12 total) socket head bolts (1) securing distribution cover (2) to cam ring (3) and bearing support housing (4), using 10 millimeter (mm) hex key and/or hex driver. Leave two opposite bolts partially engaged; turn motor horizontal and break open to drain oil. Set motor into tank of a parts washer with wheel studs down. Remove remaining bolts. Clean motor components as they are removed.

FIGURE 11



B) Refer to figure 12.
Carefully lift distribution cover from cam ring.

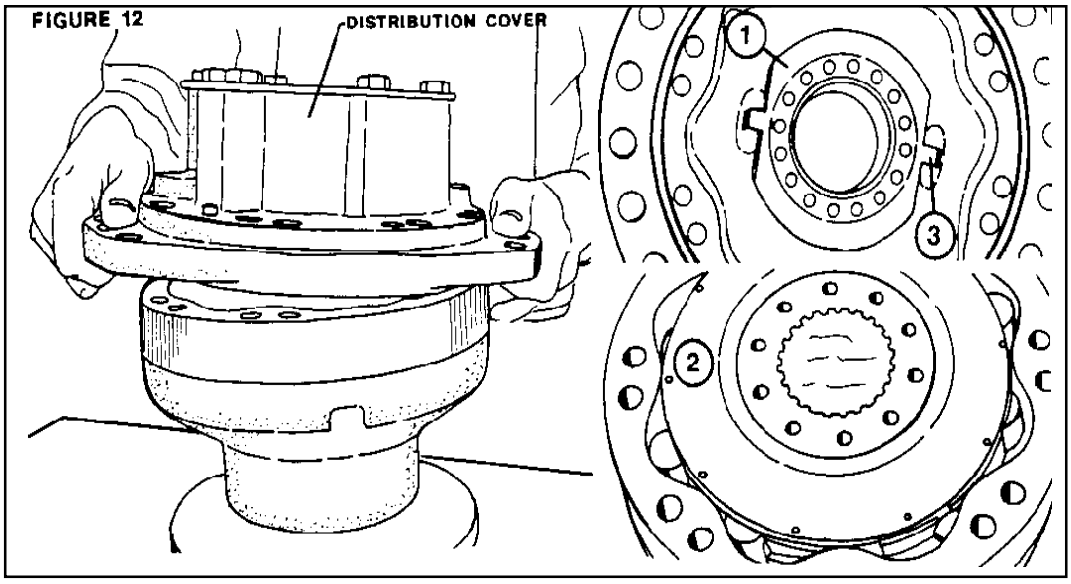
NOTE - If cover is lifted straight up, distributor (1) will tend to adhere to cylinder block (2) because of oil film between mating surfaces. To insure that distributor remains seated in cover, lift cover on one side only to bread adhesion between distributor and cylinder block. ALTERNATE METHOD: CAREFULLY insert thin piece of wood under location tab (3) of distributor and pry up to break adhesion.

CAUTION - Inserting wood too far may scratch mating surfaces of distributors and/or cylinder block.

1.07 SERVICE PROCEDURES

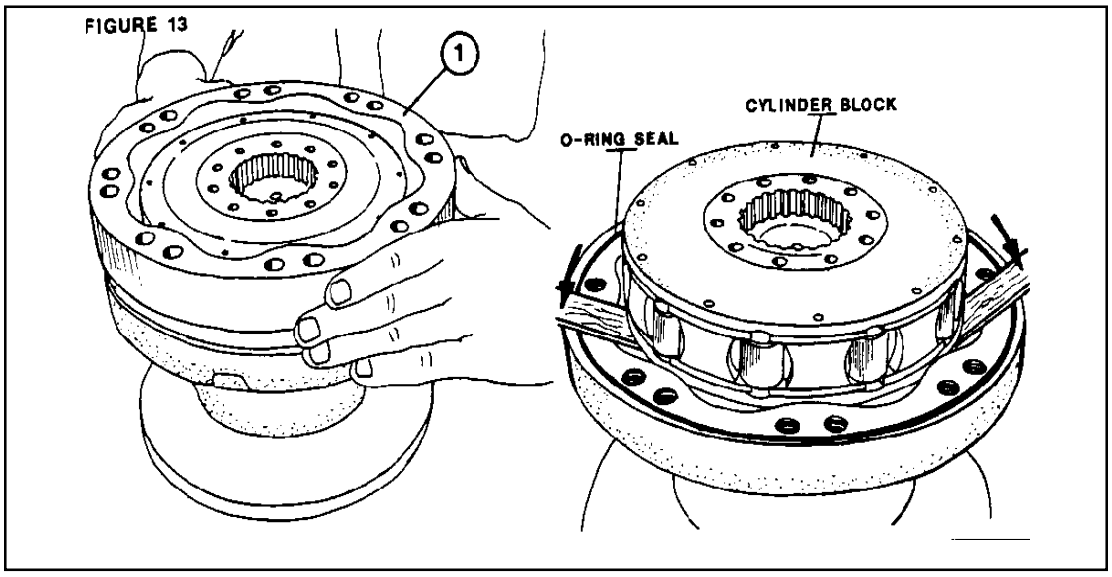
DISASSEMBLY

SHAFT/GREASE SEALS AND BEARINGS (1.07-2)



C) Refer to figure 13.
Remove cam ring (1) and discard large o-ring seals in distribution cover and bearing support housing grooves.

D) Carefully remove cylinder block from the splined wheel shaft by lifting straight up. If necessary, apply leverage under block on opposite sides at the same time. (Figure 13).

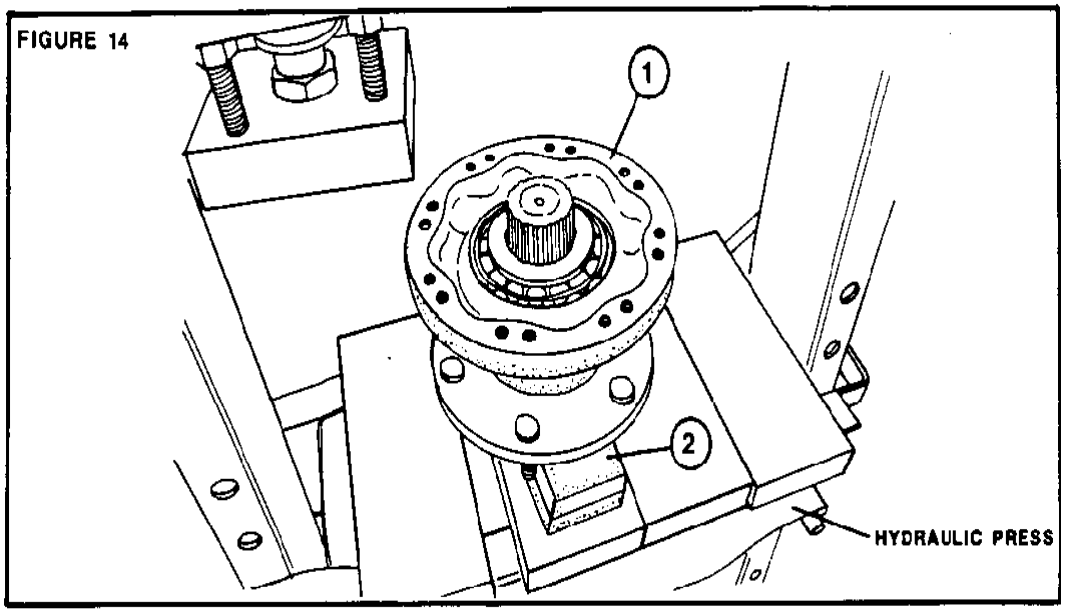


1.07 SERVICE PROCEDURES

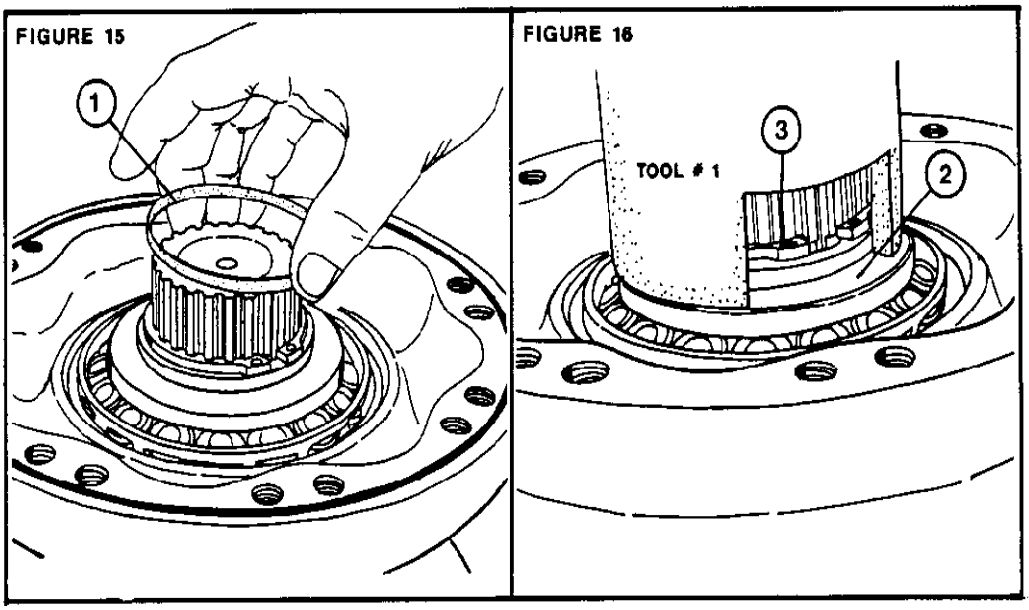
DISASSEMBLY

Shaft/Grease Seals and Bearings (1.07-2)

E) Refer to figure 14.
Position bearing support housing and wheel shaft assembly (1) in a hydraulic press capable of applying 30,000 or more pounds of pressing force. Place steel arbor plates (2) between wheel studs to support shaft so that press force is NOT applied directly on to wheel studs.



F) Refer to figures 15 and 16.
Remove snap ring retainer (1) (NOT included in later model wheel motors); it may be necessary to pry it loose with a screwdriver or other thin-edged tool. Using press and tool number one, compress inner bearing (2) while removing snap ring (3) with external snap ring pliers.



1.07 SERVICE PROCEDURES

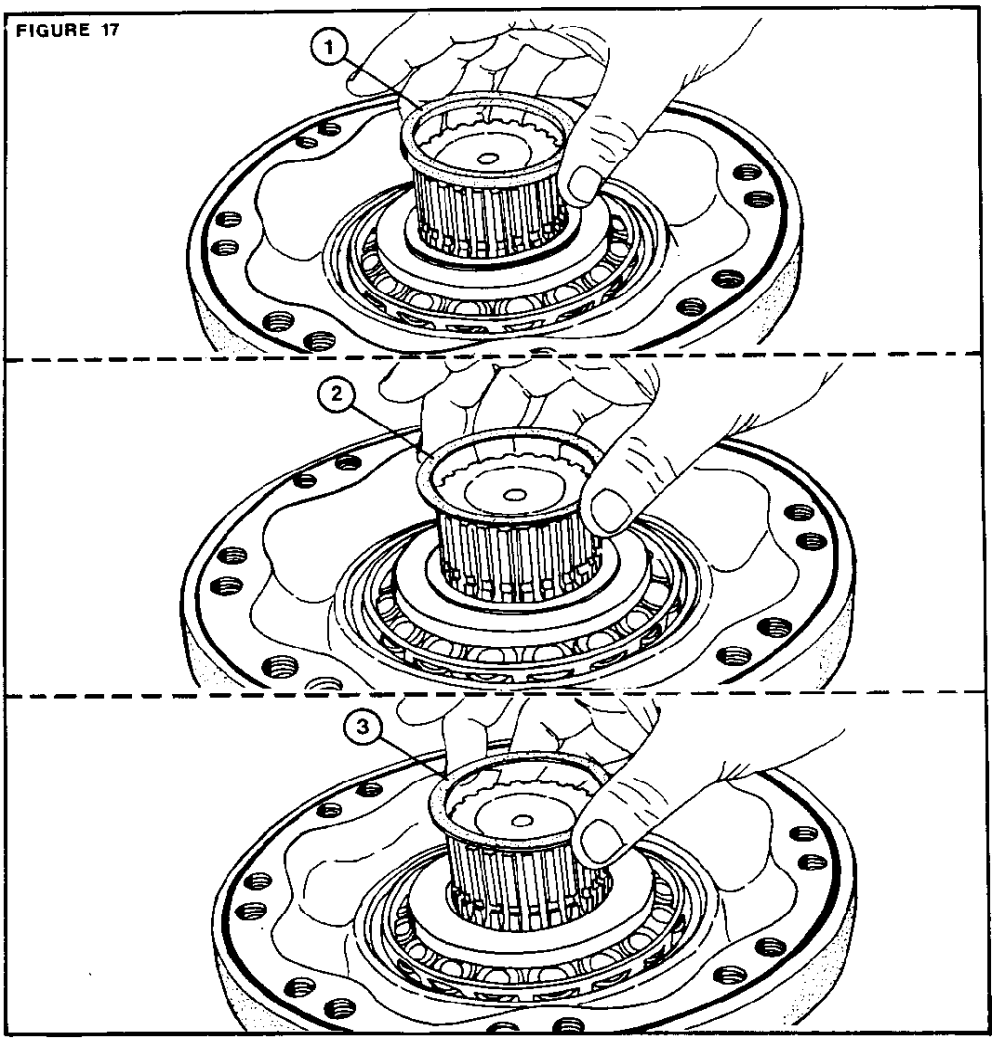
DISASSEMBLY

Seals and Bearings (1.07-2)

G) Refer to figure 17.
Remove snap ring spacer (1). Remove old shims (2) and shim support washer (3). Discard shims if damaged or deformed.

NOTE - Early versions of motor may have a select fit shim in place of shims and shim support washer. This shim may be reused or replaced, if necessary; by using a shim pack and shim support washer.

FIGURE 17



1.07 SERVICE PROCEDURES

DISASSEMBLY

Seals and Bearings (1.07-2)

H) Refer to figure 18.
Using tool number two, a 3/4" bolt and four bolts from motor, extract wheel shaft (1) from bearing support housing (2). Tighten four bolts and use 3/4" bolt as a jack screw to pull bearing support housing off of shaft.

NOTE: - The entire inner bearing, outer race of outer bearing and inner shaft seal will come off the bearing support housing. Rollers and inner race of outer bearing, outer grease seal and deflector will remain on wheel shaft.

Lift out inner race and rollers of inner bearing from bearing support housing.

NOTE - Make sure bearing rotates freely without roughness, and does NOT show signs of extreme wear. If replacement is necessary, replace both bearing and cup (outer race).

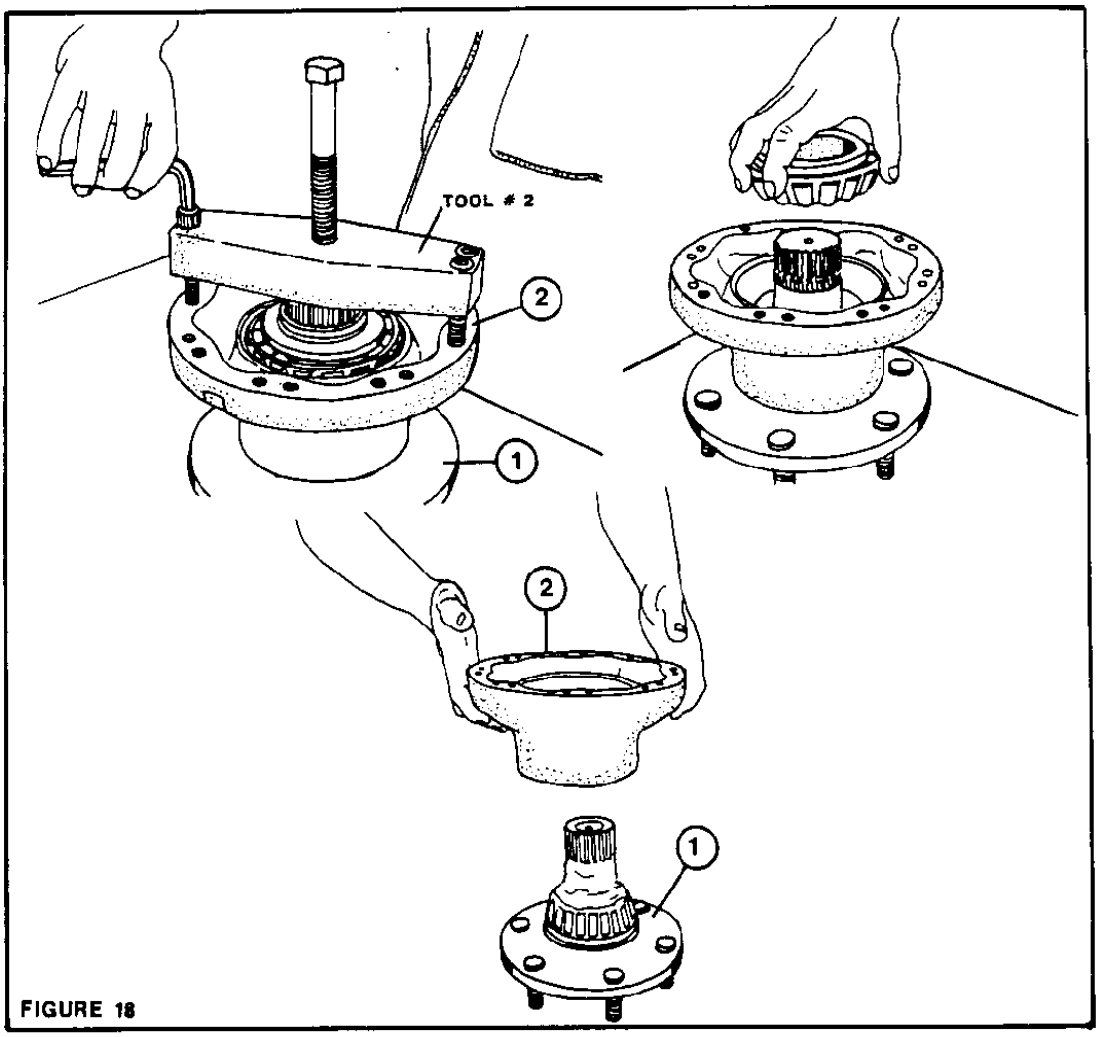


FIGURE 18

1.07 SERVICE PROCEDURES

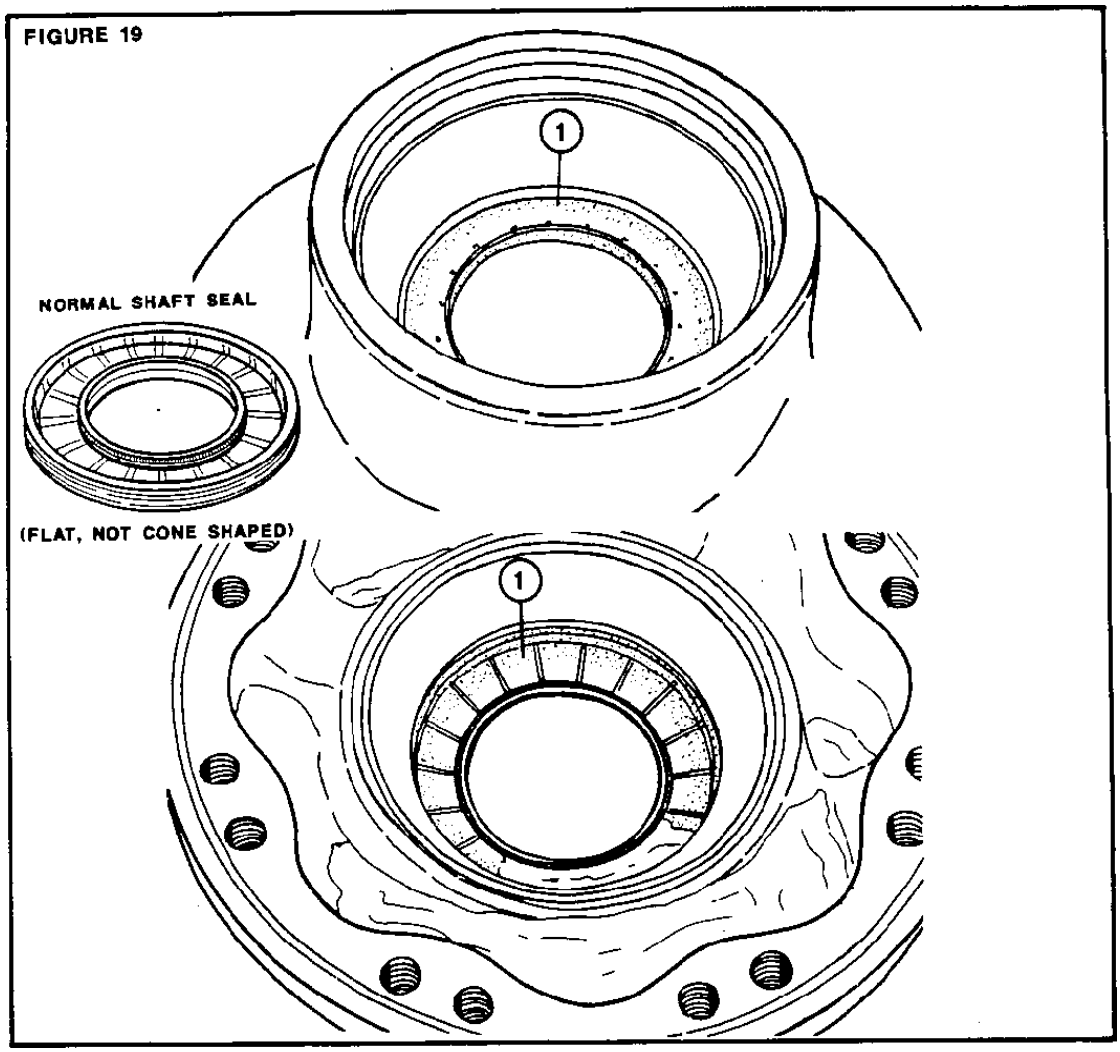
DISASSEMBLY

Seal and Bearings (1.07-2)

l) Refer to figure 19.
Inspect inner shaft seal (1) for nicks, cuts, scratches and proper shape. A seal in good condition will be flat and properly seated in its groove. A blown shaft seal will be cone shaped (not flat) as shown, due to excessive motor case pressure.
If shaft seal replacement is necessary, continue with step 10; if NOT, continue with step 13 on page 66.

NOTE - Even though inner shaft seal may appear to be in good condition, it would be good preventive maintenance to replace it. The motor may have experienced extended high operating temperature and/or repeated motor case pressure surges that could weaken the seal by fatigue, with no noticeable effect on appearance.

FIGURE 19



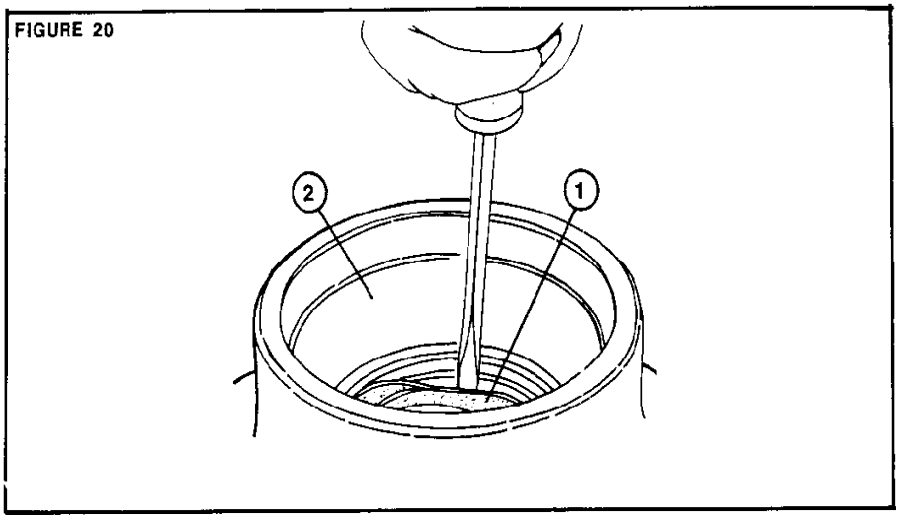
1.07 SERVICE PROCEDURES

DISASSEMBLY

Seals and Bearings (1.07-2)

J) Refer to figure 20.
Using a screwdriver, carefully pry out inner shaft seal (1) taking care NOT to scratch or nick bearing races (2). Shaft seal must be destroyed in order to remove it.

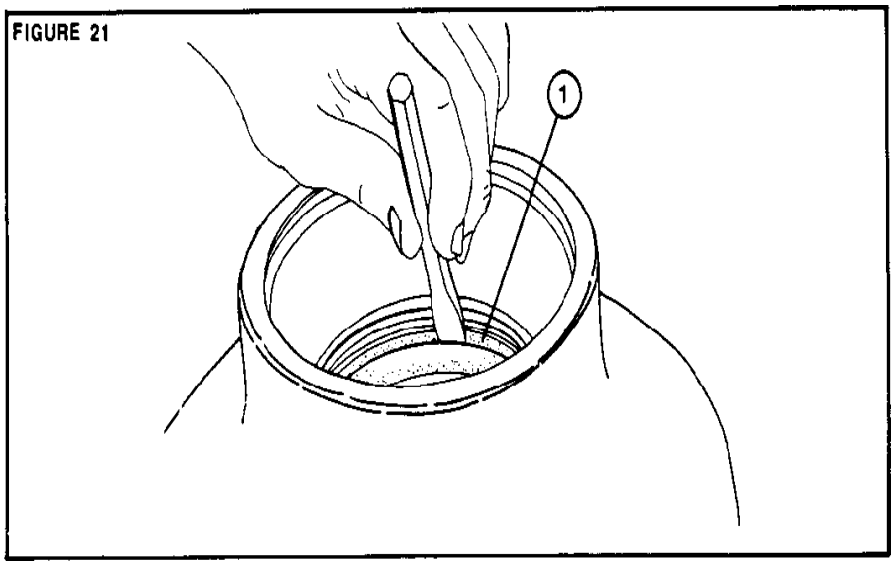
FIGURE 20



NOTE - To install new inner shaft seal, the outer race of the inner roller bearing MUST first be removed.

K) Refer to figure 21.
With inner shaft seal removed, carefully remove inner bearing race (1) using a suitable internal bearing puller; or by using a soft metal punch.

FIGURE 21



1.07 SERVICE PROCEDURES

DISASSEMBLY

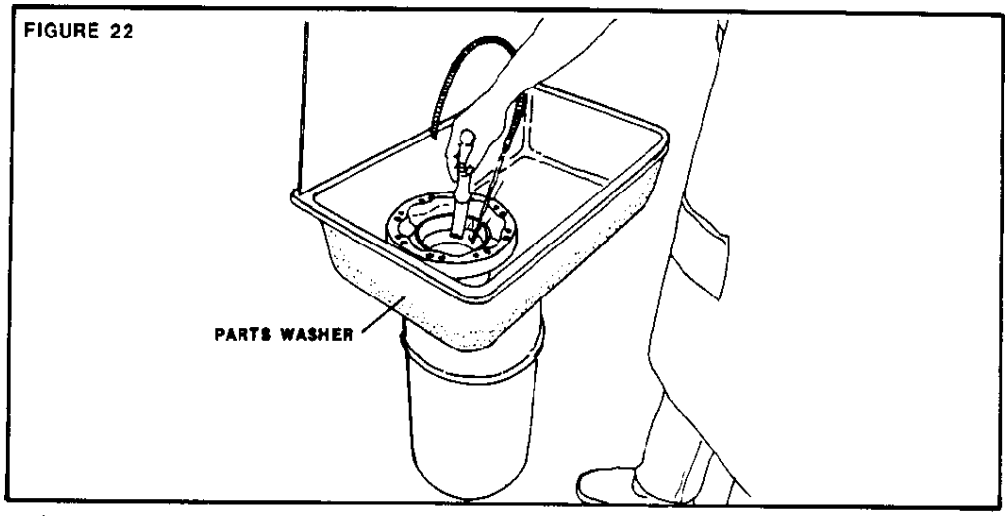
Seal and Bearings

NOTE - Check overall condition of OUTER bearing. If replacement is necessary, remove outer race with suitable internal bearing puller or drive out with a soft metal punch.

L) Refer to figure 22.

Wash all parts in clean solvent and thoroughly dry using compressed air. Wrap parts and keep them in a clean area prior to reassembly.

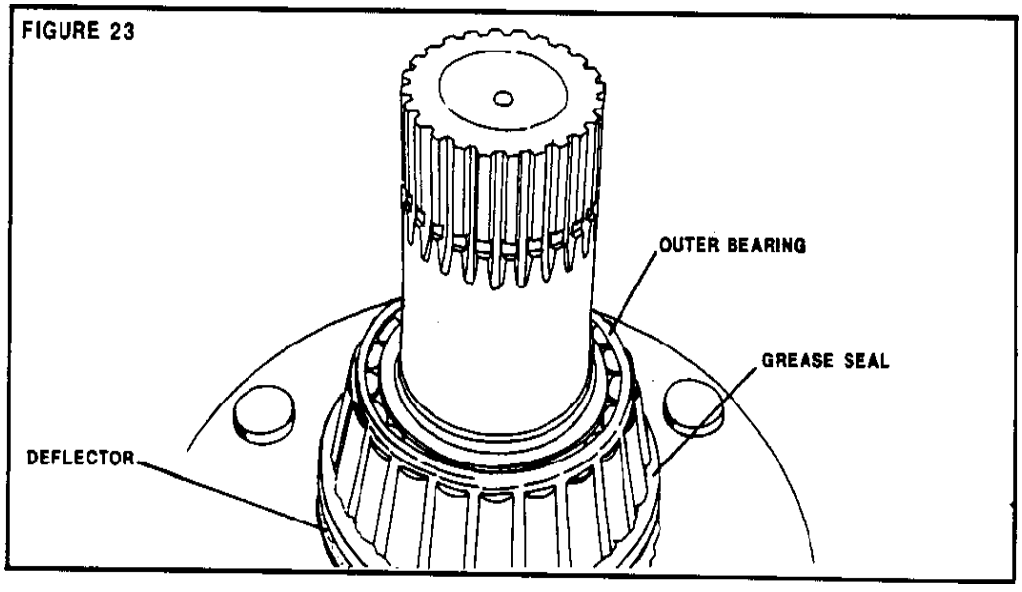
FIGURE 22



M) Refer to figure 23.

Inspect outer grease seal and deflector under outer bearing on wheel shaft for any signs of damage. If grease seal and/or deflector replacement is necessary, continue with step 1 on page 71. If replacement is NOT necessary, continue with step 1 on page 75 or step 1 on page 78, if shaft seal is NOT being replaced.

FIGURE 23



1.07 SERVICE PROCEDURES

DISASSEMBLY

Seals and Bearings (1.07-2)

Outer Bearing, Grease Seal and Deflector Removal

A) Refer to figures 24 and 25.
On a clean work bench, pull inner race and rollers of outer bearing (1) from wheel shaft with the use of a bearing separator/extractor as shown.

NOTE - Lip of bearing separator MUST be positioned under deflector (1) as shown in figure 25. In this operation, the deflector (1) and outer grease seal (2) are destroyed. Clean bearing and wheel shaft. Inspect for abnormal wear, or damage from bearing separator.

FIGURE 24

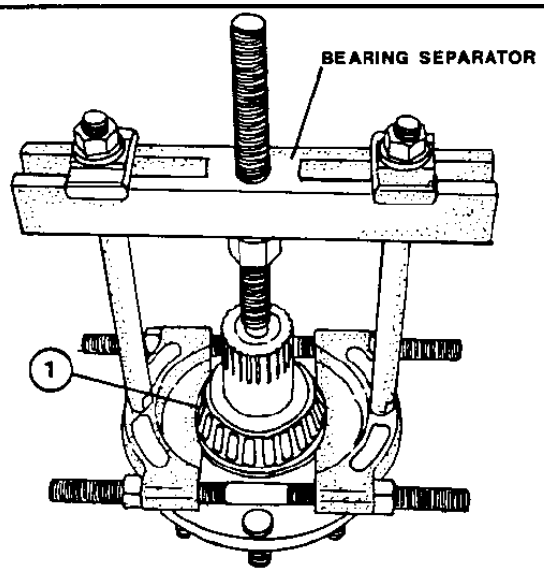
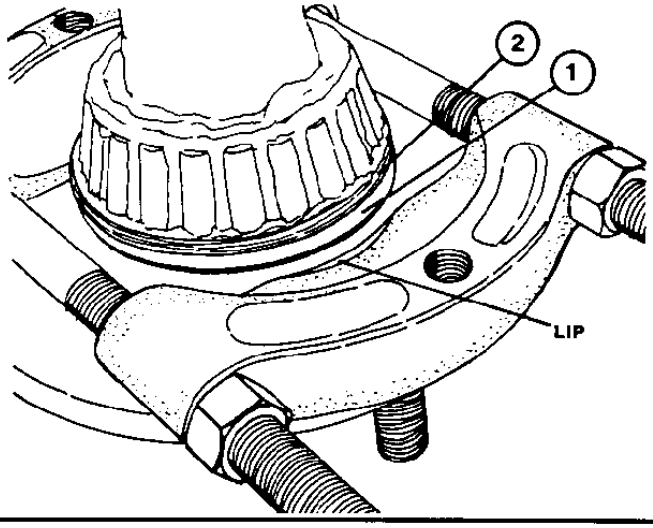


FIGURE 25



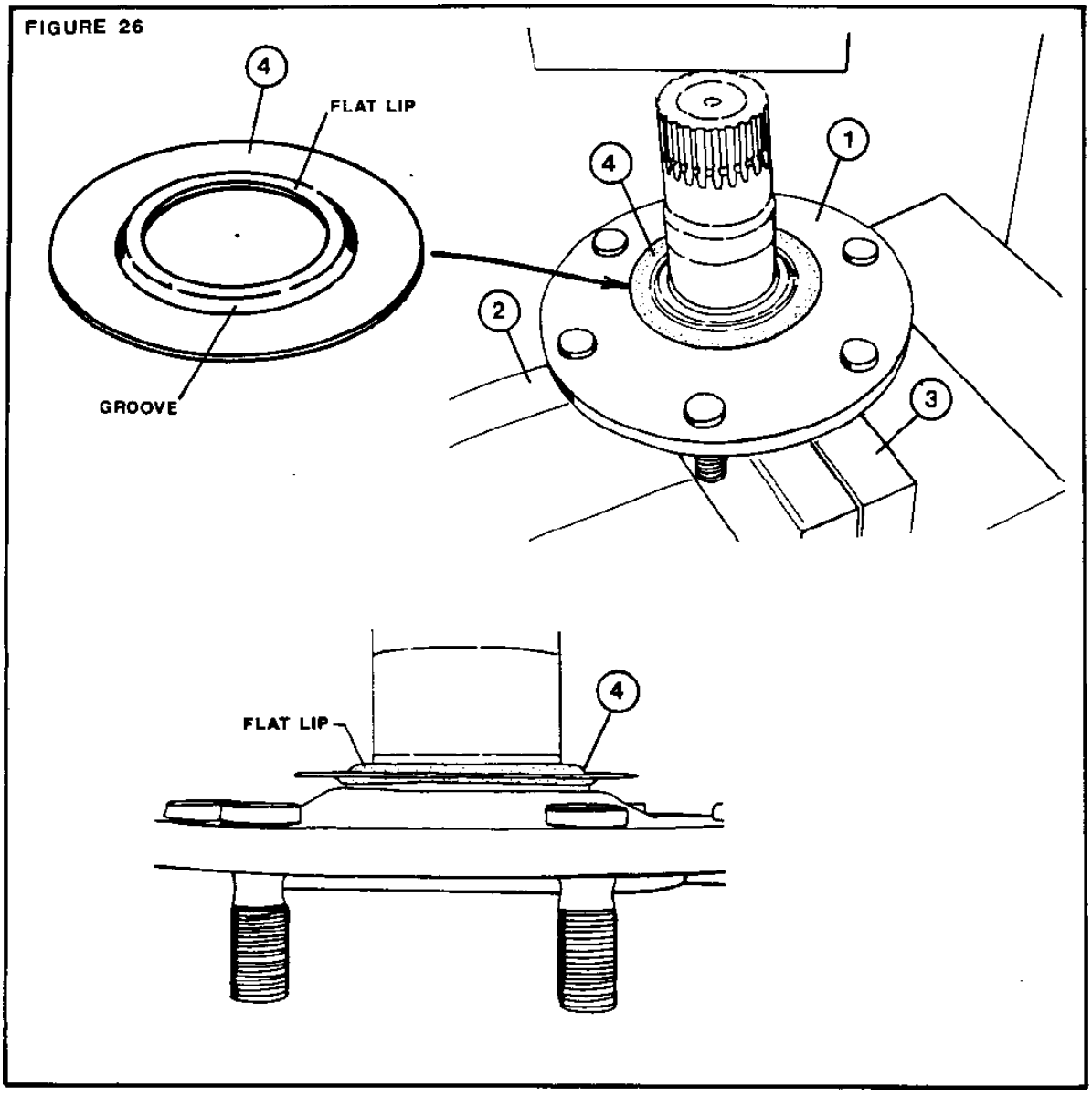
1.07 SERVICE PROCEDURES

REASSEMBLY

Outer Bearing, Grease Seal and Deflector Installation

A) Refer to figure 26.
Position wheel shaft (1) under hydraulic press (2). Use steel arbor plated (3) to support shaft so that press force is NOT applied directly onto wheel studs. Place new deflector (4) onto wheel shaft as shown. Apply a generous amount of bearing grease around the flat lip on inner surface of deflector.

FIGURE 26

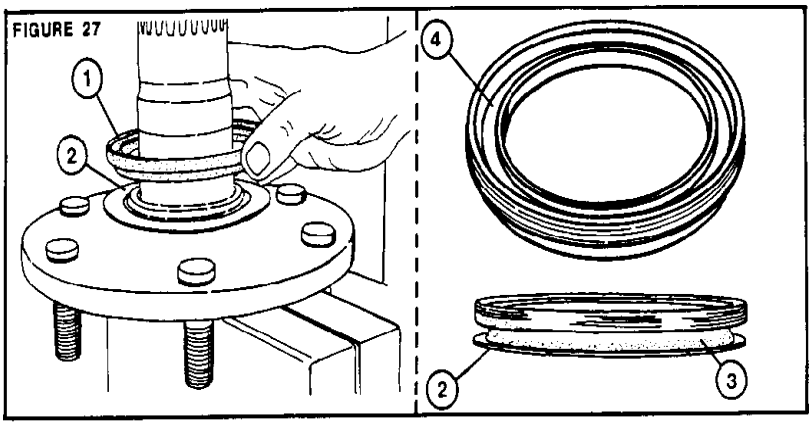


1.07 SERVICE PROCEDURES

SEALS AND BEARINGS (1.07-2)

REASSEMBLY

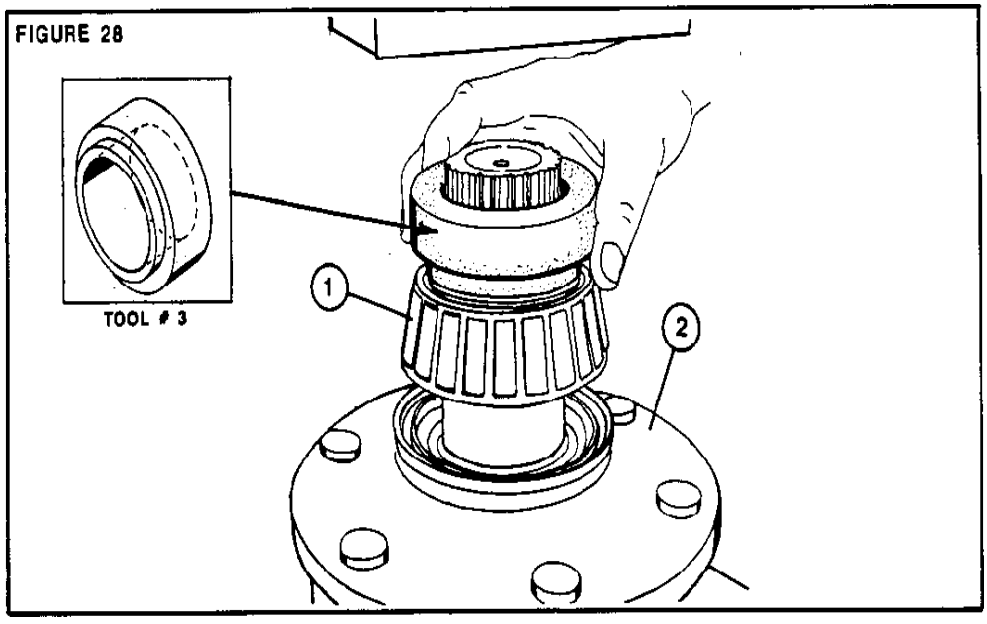
B) Refer to figure 27.
Place new outer grease seal (1) onto deflector (2) with lip of seal (3) against deflector and groove (4) facing up. Apply a generous amount of bearing grease to inner groove (4) of grease seal.



C) Refer to figure 28.
Pack or repack outer bearing (1) with high quality bearing grease.

NOTE - Make sure bearing rotates freely without roughness. If replacement is necessary, replace both bearing and cup.

Install greased bearing onto wheel shaft (2) with large diameter facing down (see figure 28). Place tool number 3 onto top of bearing. The tool is designed to apply pressing force to inner race of bearing, making sure pressing force is NOT applied to roller cage.



1.07 SERVICE PROCEDURES

SEALS AND BEARINGS (1.07-2)

REASSEMBLY

D) Refer to figure 29.
Place pressing tool (1) or similar tool onto tool (2) previously installed. Proceed to press bearing downward on the wheel shaft until a minimum pressing force of 22,500 pounds (27,000 lbs - MS11 motors) is reached. As bearing is being pressing into place, be sure that grease seal is positioned properly to avoid being crushed by bearing.

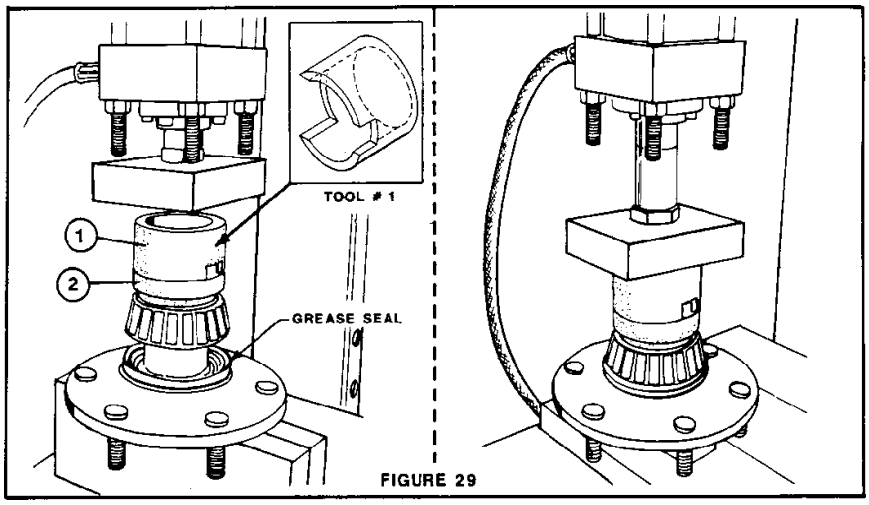
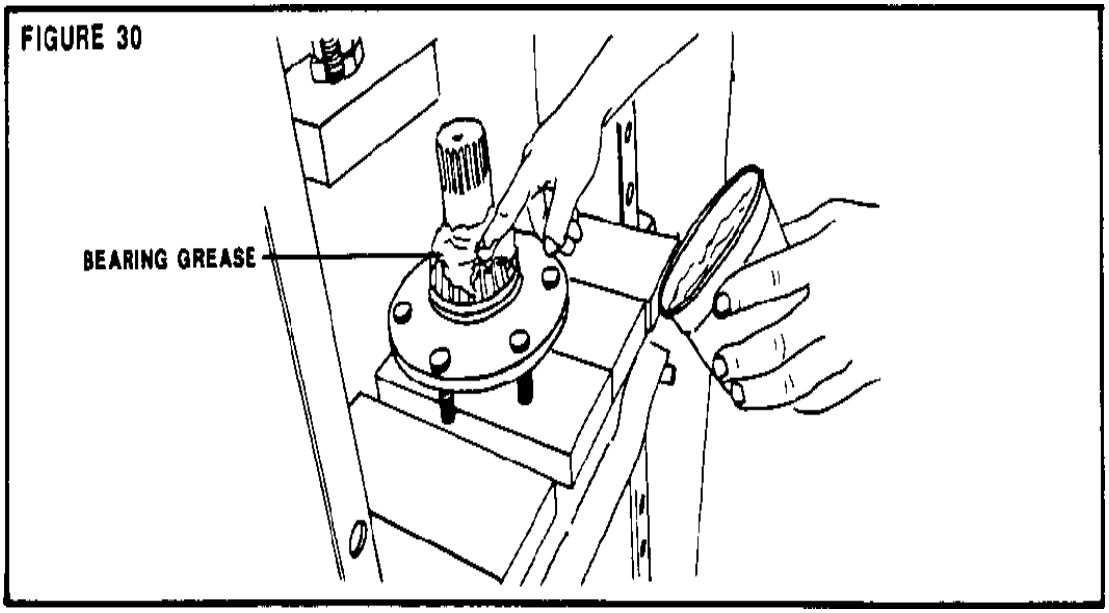


FIGURE 29

E) Refer to figure 30.
Relieve pressure and remove pressing tools. If necessary, apply more grease to rollers along bearing. If inner shaft seal is NOT being replaced, proceed with step 1 on page 78, otherwise proceed with step 1 on page 75.

FIGURE 30



1.07 SERVICE PROCEDURES

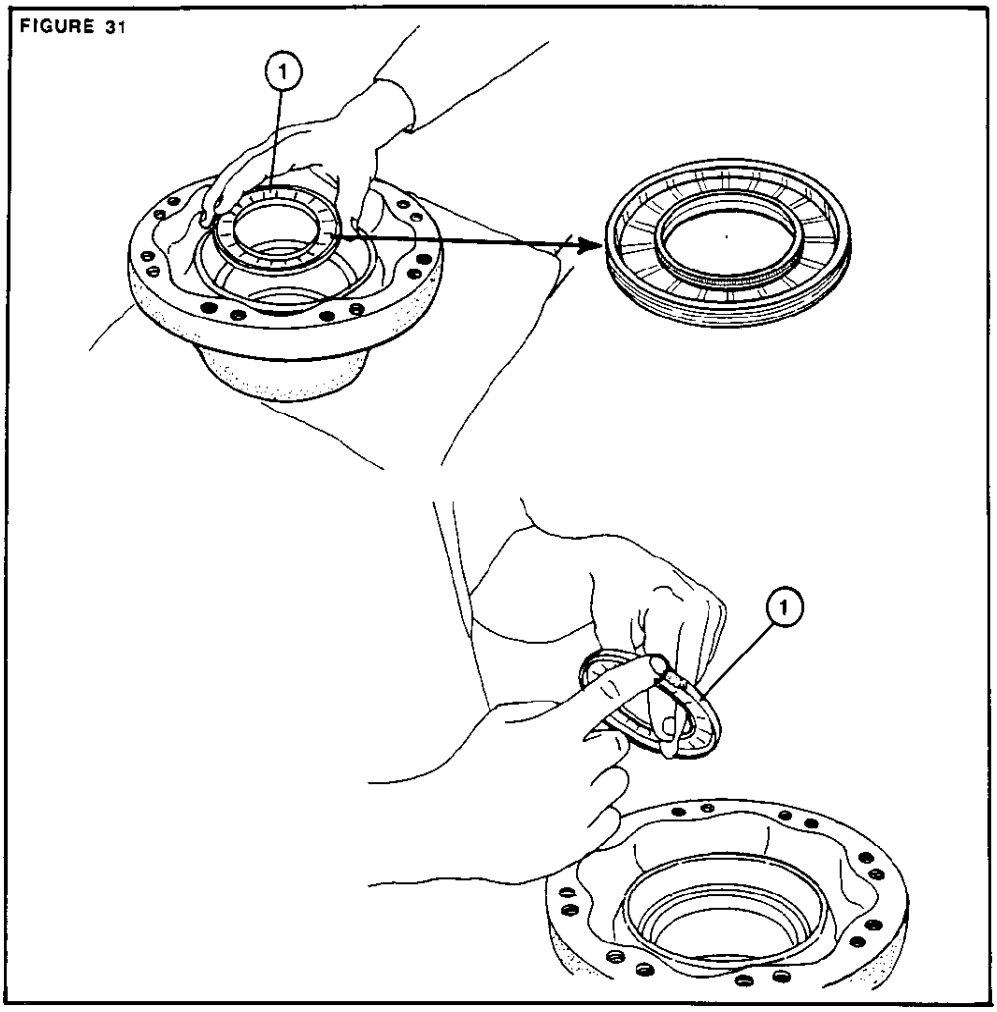
SEALS AND BEARINGS

REASSEMBLY

Inner shaft seal Installation

A) Refer to figure 31.
Apply grease to outer edge of a new inner shaft seal (1) before installation.

FIGURE 31



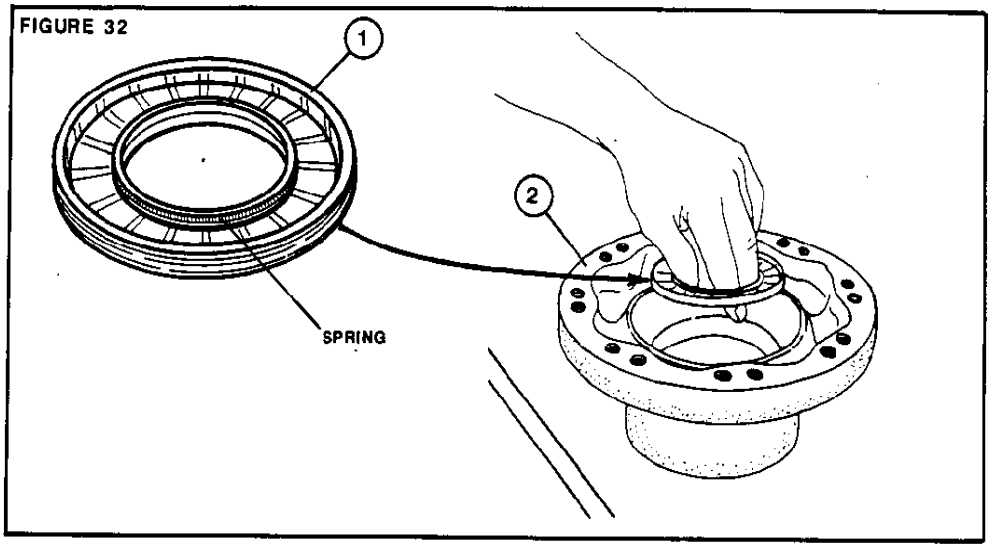
1.07 SERVICE PROCEDURES

SEALS AND BEARINGS

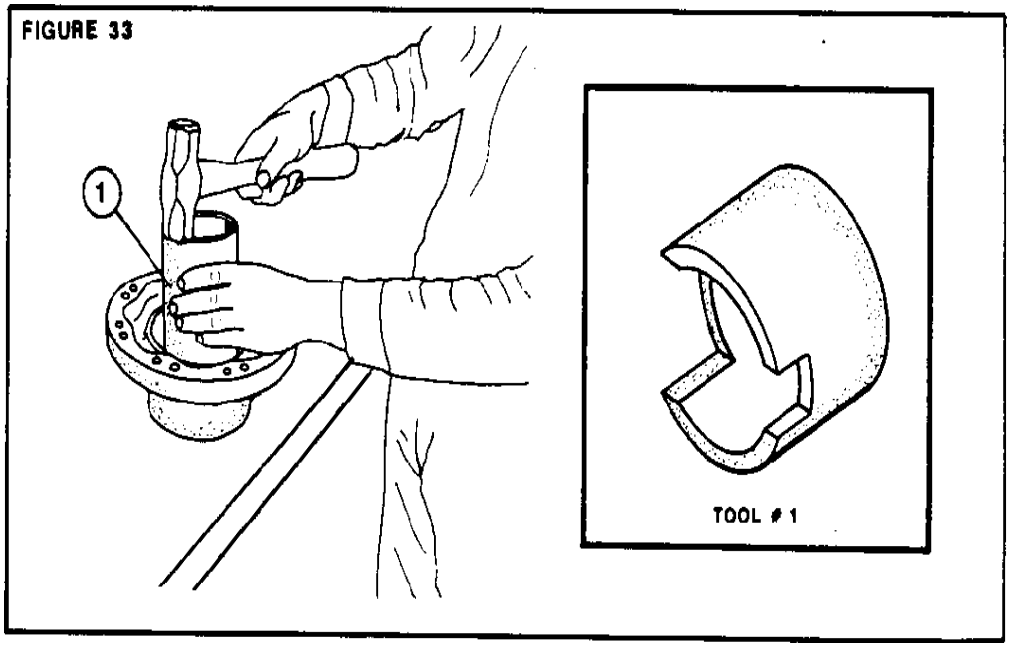
REASSEMBLY

INNER SHAFT SEAL INSTALLATION

B) Refer to figure 32.
Place inner shaft seal (1) into bore of bearing support housing (2) as shown, with spring side of seal facing up.

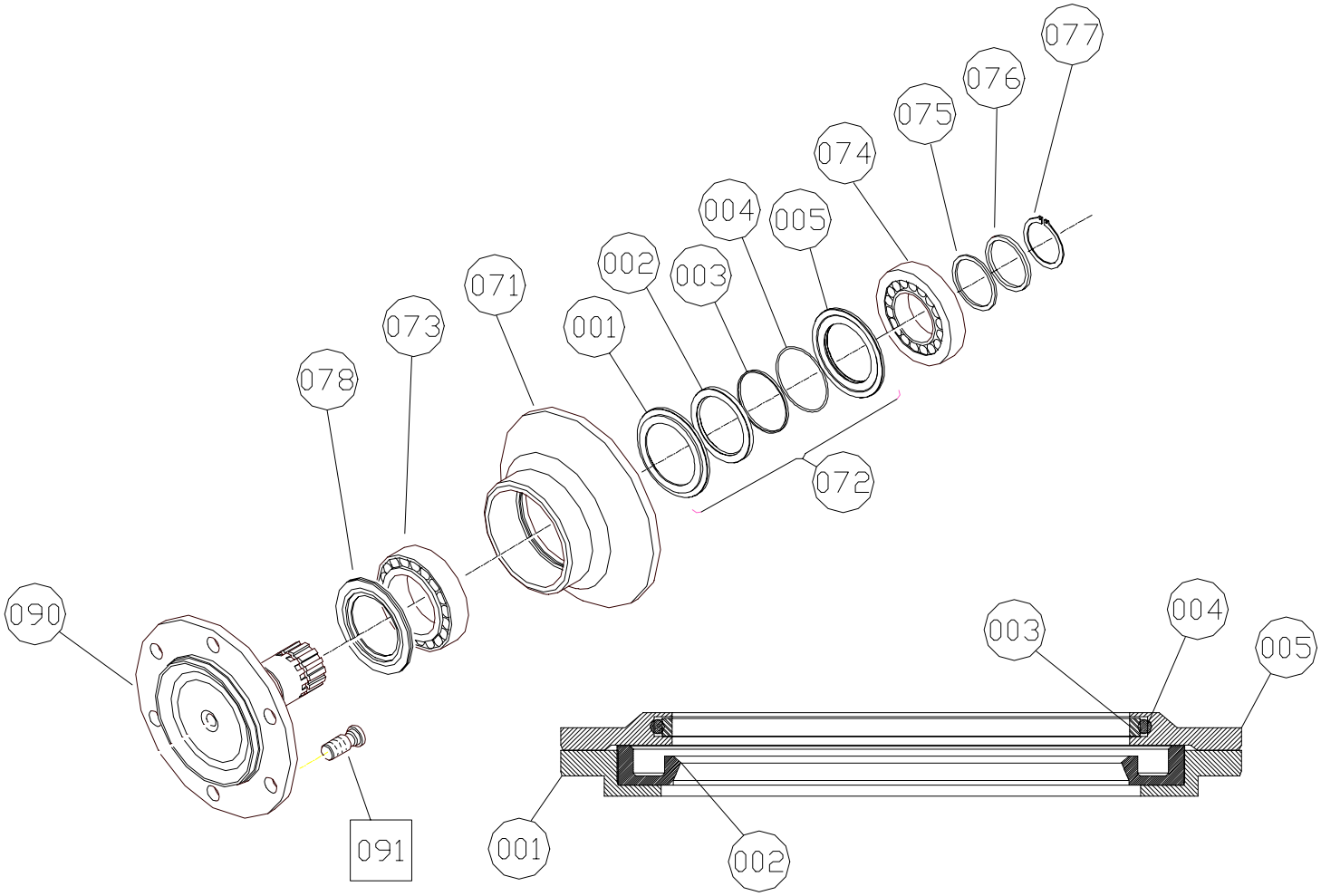


C) Refer to figure 33.
Tap in new shaft using a properly-sized steel tube (1) until seal seats in bore. Tool number 1 can also be used to install shaft seal.



HIGH PRESSURE SEAL INSTALLATION

BEARING SUPPORT COMPONENTS SHOWN FOR REFERENCE



ITEM #	PART #	DESCRIPTION
071	150378	BEARING SUPPORT
072	150311	HIGH PRESSURE SEAL
001	*	OUTER SEAL FLANGE
002	*	SEAL
003	*	BACKUP RING
004	*	O-RING
005	*	INNER SEAL FLANGE
073	103911	OUTER BEARING
074	103914	INNER BEARING
075	701691-01	SHIM PACK
076	103916	SNAP RING SPACER
077	103917	SNAP RING
078	105264	DEFLECTOR & GREASE SEAL
090	103907	SHAFT WHEEL HUB
091	103908	STUD M20

*HIGH PRESSURE SEAL COMPONENTS

1.07 SERVICE PROCEDURES

SEALS AND BEARINGS

REASSEMBLY

Bearing Race Installations

A) Refer to figure 34.
Place inner bearing race (1) into bore of bearing support housing (2).

NOTE - Check to make sure that bearing race is placed correctly in bore BEFORE driving in race.

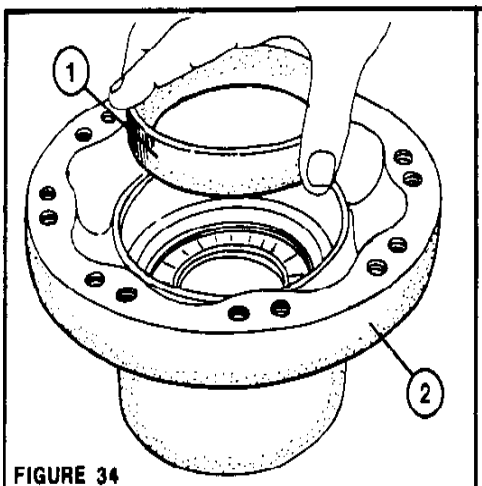


FIGURE 34

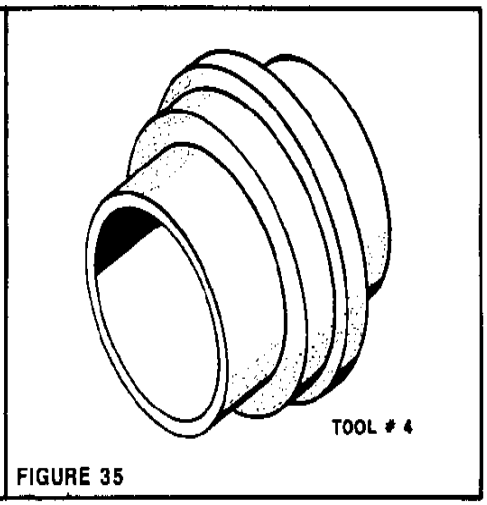


FIGURE 35

B) Refer to figure 35.
Use appropriate end to tool number 4 to press or drive in bearing race until it is properly seated in bore.

NOTE - Use care when driving or pressing in bearing race to prevent damage to race.

C) Refer to figure 36.
If outer race of outer bearing (1) is being replaced, turn bearing support housing (2) over and use other end of tool number 4 to press or drive in bearing race until it is properly seated.

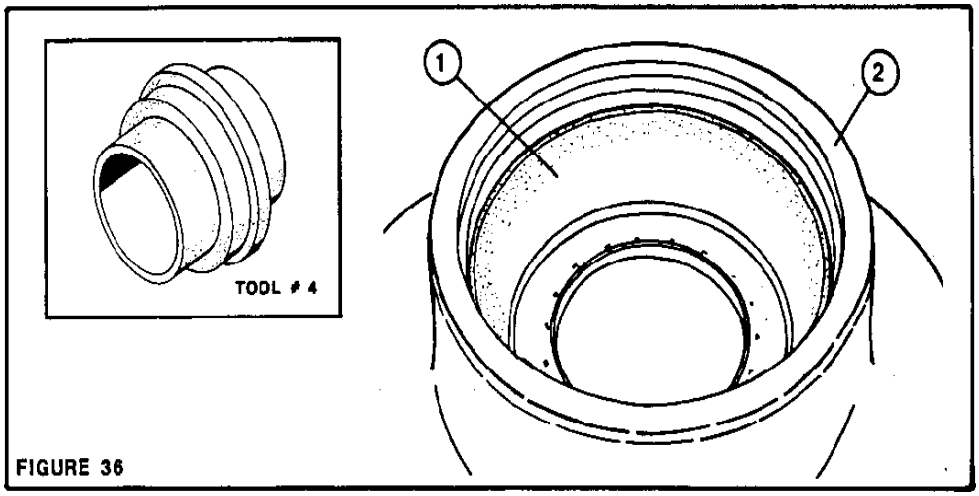


FIGURE 36

1.07 SERVICE PROCEDURES

SEALS AND BEARINGS (1.07-2)

REASSEMBLY

Installation of Bearing Support Housing and Related Parts

A) Refer to figure 37.
Check to make sure that outer bearing race in bearing support housing (1) is clean and free of any signs of dirt. Apply grease on inner edge of shaft seal (2) and outer edge of grease seal (3) before installing bearing support housing onto shaft seal.

NOTE - Apply tape or cardboard around shaft splines to prevent damage to shaft seal as bearing support housing is lowered onto wheel shaft.

CAREFULLY lower housing (1) down onto wheel shaft (4).

NOTE - Be sure that grease seal (3) is properly centered to fit into bore of bearing support housing as it is lowered into place.

Rotate bearing support housing while applying downward force to work parts into place.

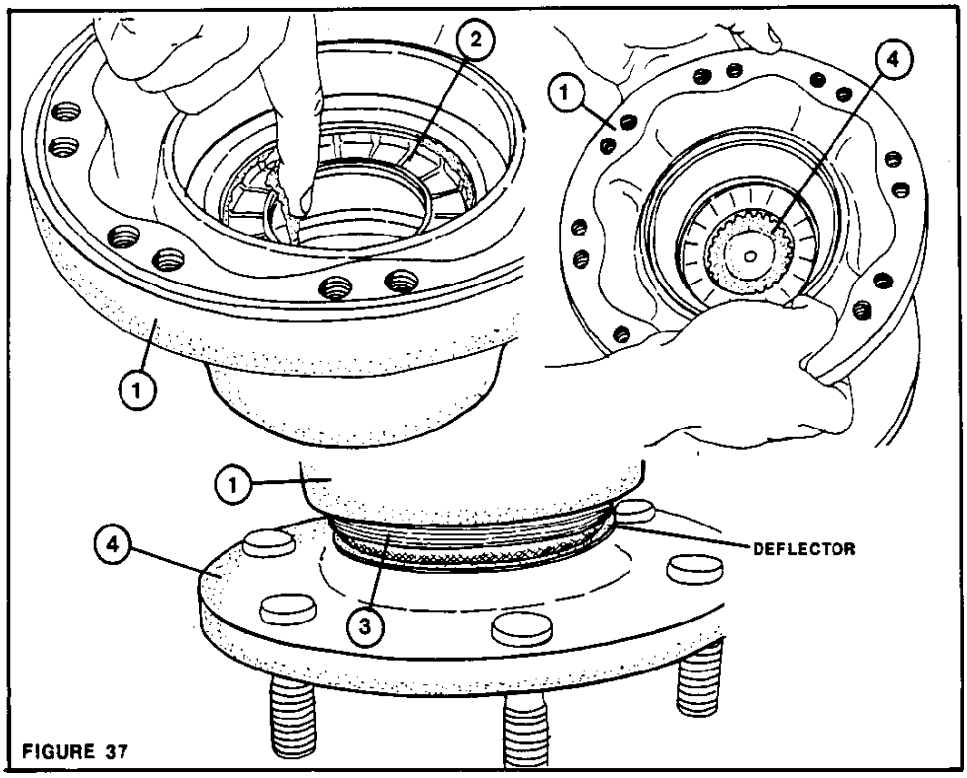


FIGURE 37

1.07 SERVICE PROCEDURES

SEALS AND BEARINGS (1.07-2)

REASSEMBLY

Installation of Bearing Support Housing and Related Parts

B) Refer to figure 38.
Set inner race and rollers of the inner bearing (1) onto wheel shaft (2).

IMPORTANT - Do NOT pack bearing with grease. Bearing is lubricated by hydraulic oil.

Pressing Inner Bearing Roller Race Onto Shaft

A) Refer to figure 39.
Position wheel shaft (1) in a hydraulic press capable of applying 30,000 pounds of force.

NOTE - Do NOT pick up bearing support housing (2) without the inner bearing race (3) pressed in place.

Place steel arbor plates (4) between wheel studs to support shaft so that press force is NOT applied directly onto wheel studs (5). Place pressing tool number 1 on top of bearing race (3). Press bearing down onto shaft until bearing rollers are firmly seated against outer race. Relieve pressing force and remove tool.

FIGURE 38

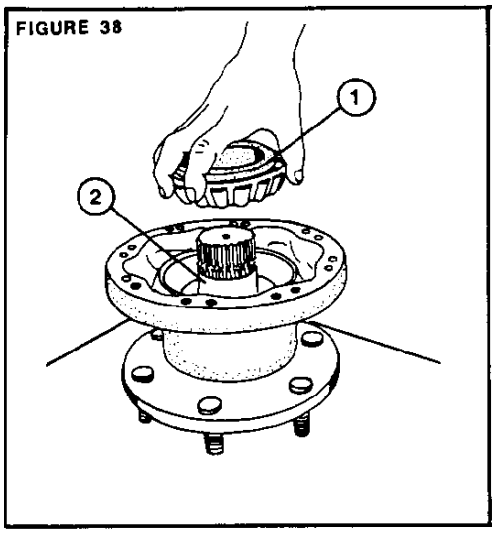
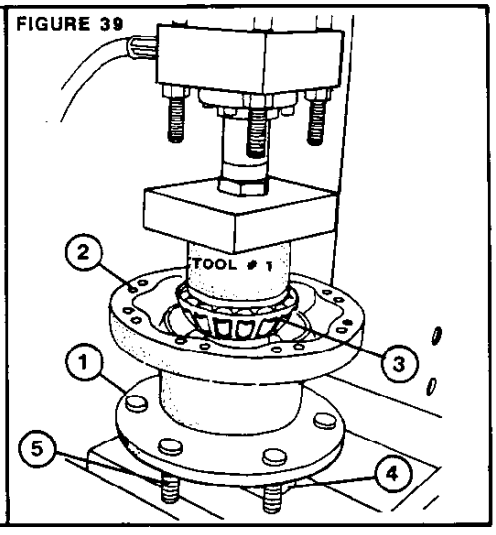


FIGURE 39



Installation of Bearing Pre-Load Shims and Related Parts

If one or both bearings have been replaced, bearing pre-load must be adjusted according to the following procedure found on page 80. If all original bearings are used, original shim thickness may be used (Replace shim support washer and shims, if necessary); continue with step 1 on page 81.

1.07 SERVICE PROCEDURES

SEALS AND BEARINGS (1.07-2)

REASSEMBLY

Bearing Pre-Load Adjustment

A) Refer to figure 40 and 41.
Place snap ring space (1) on top of bearing race (2). Using external snap ring pliers (3), install snap ring (4) into groove on shaft and position snap ring at top of groove.

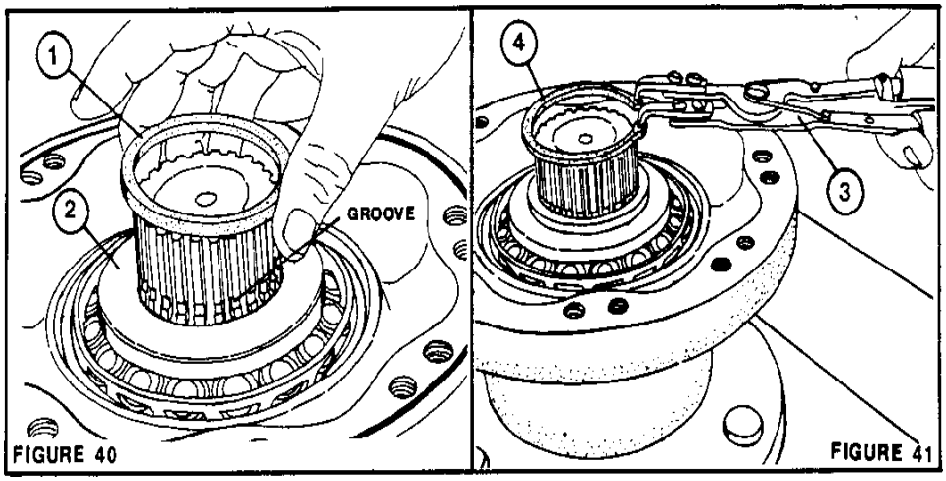
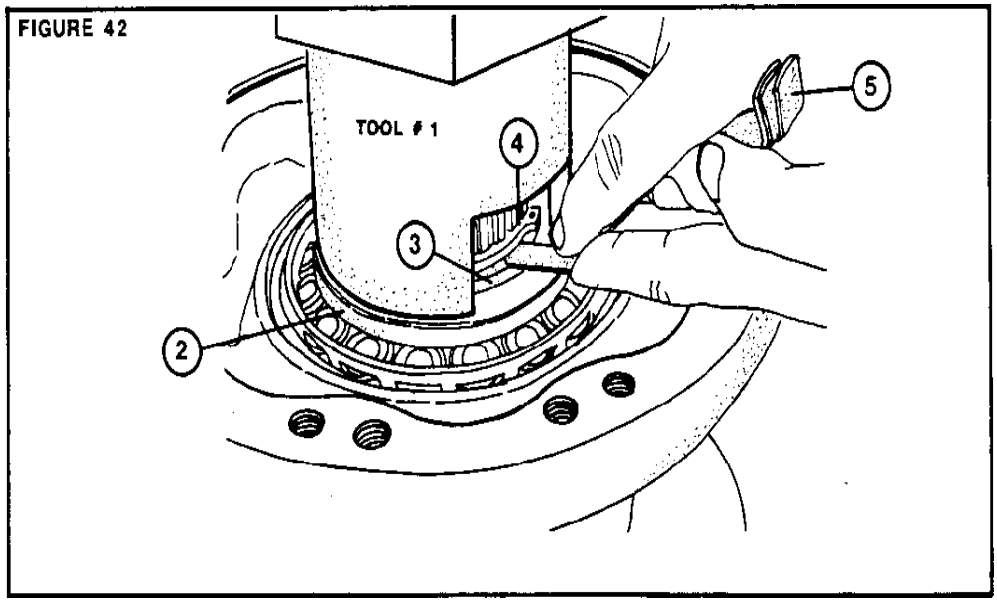


FIGURE 40 FIGURE 41

B) Refer to figure 42.
Place pressing tool number 1 (shown below) on top of inner bearing roller race (2). Compress bearings with a pressing force of 22,500 pounds (27,000 lbs - MS11 motor). WHILE maintaining required pressing force on bearings, measure and record height of gap between snap ring spacer (3) and snap ring (4) using feeler gage (5). Relieve pressing force and remove tool.

FIGURE 42



1.07 SERVICE PROCEDURES

SEALS AND BEARINGS

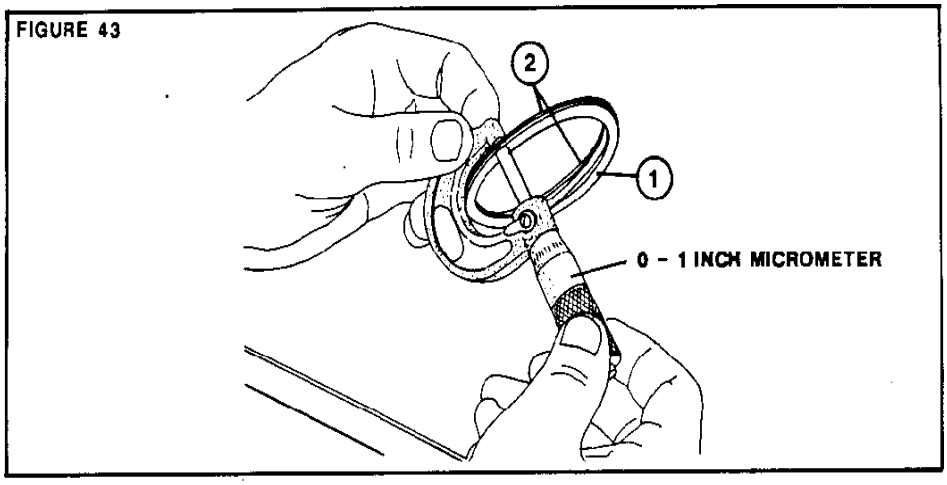
REASSEMBLY

Bearing pre-load adjustment

C) Refer to figure 43.
Add a value of .006" (.005", MS11 motor) to the recorded gap height measurement. Using shim support washer (1) and shims (2) taken from a new shim pack, build up correct thickness to obtain new determined measurement by using a 0-1" micrometer. This shims can be "peeled" off as needed, to reduce shim pack to required thickness.

NOTE - If measure gap plus (+) .006" (.005") is LESS than thickness of shim support washer alone, rotate bearing support housing to help seat bearings. Reapply the 22,500 lb. (27,000 lb - MS11 motor) pressing force, and remeasure gap (see Step B, page 80).

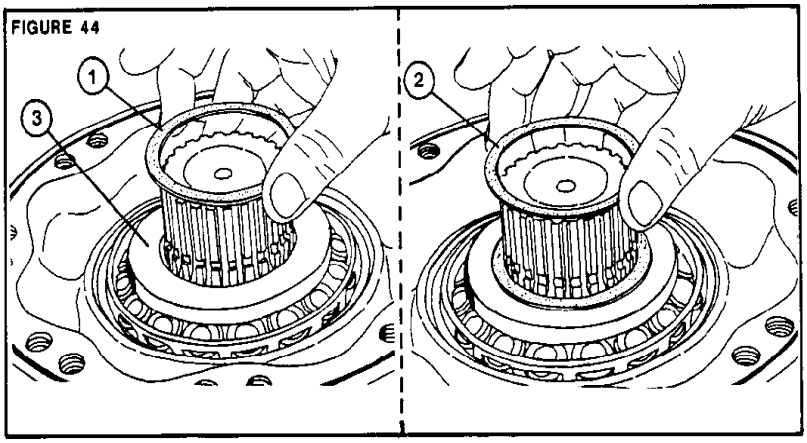
FIGURE 43



INSTALLATION OF SHIMS, SNAP RING & RELATED PARTS

A: Refer to figure 44.
Place shim support washer (1), then shims (2), on top of inner bearing race (3). The shim support washer MUST be installed first.

FIGURE 44



1.07 SERVICE PROCEDURES

INSTALLATION OF SHIMS, SNAP RING & RELATED PARTS

REASSEMBLY

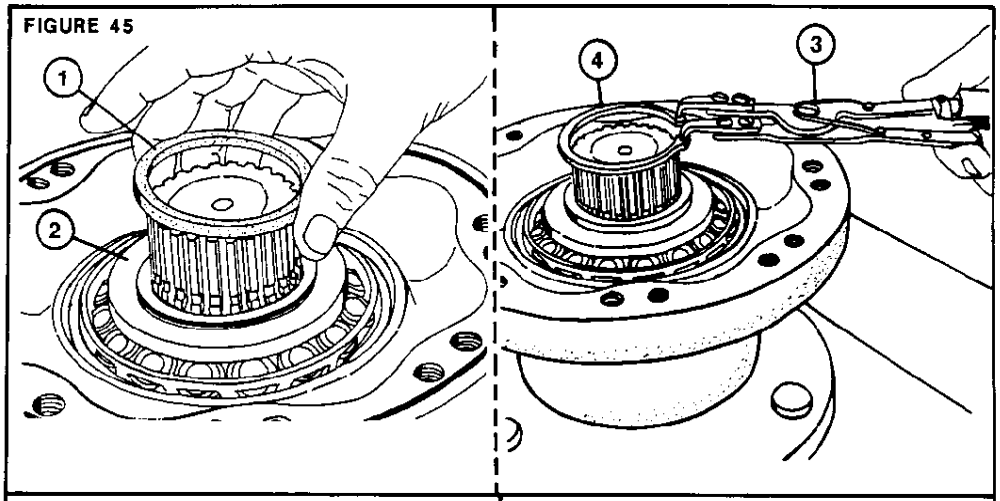
SEALS & BEARINGS (1.07-2)

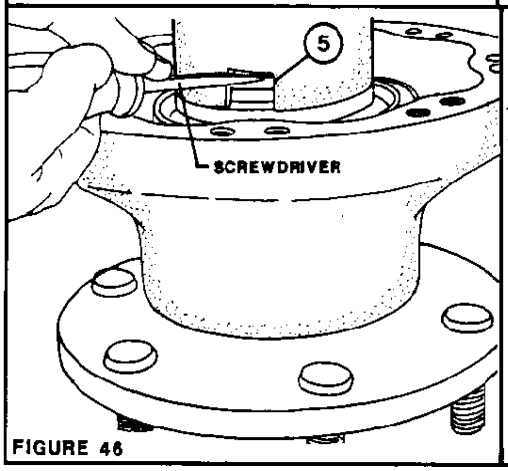
B) Refer to figures 45, 46, and 47.
Place snap ring spacer (1) on top of shims (2). Using external snap ring pliers (3), install snap ring (4) onto shaft. Compress inner bearing with tool number 1 so that snap ring can be easily positioned in groove.

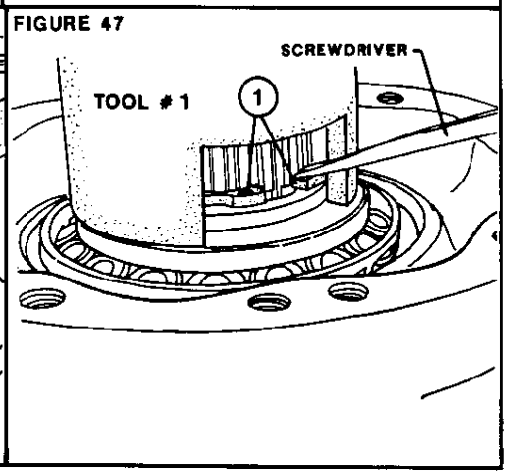
C) Push backside of snap ring down into groove by inserting a screwdriver through small notch (5) in tool (see figure 46).

D) Push ears (1) of snap ring down into groove until snap ring "snaps" into place. BE SURE THAT ENTIRE SNAP RING MAKES CONTACT WITH BOTTOM OF GROOVE (see figure 47).

E) Relieve pressing force and remove pressing tool.







1.07-2 SERVICE PROCEDURES

INSTALLATION OF SHIMS, SNAP RING & RELATED PARTS

REASSEMBLY

Seals and Bearings (1.07-2)

F) Refer to figure 48.
Place snap ring retainer (1) on top of snap ring spacer (2) as shown, so that retainer surrounds snap ring. If retainer does NOT easily fit around snap ring, snap ring is NOT properly seated.

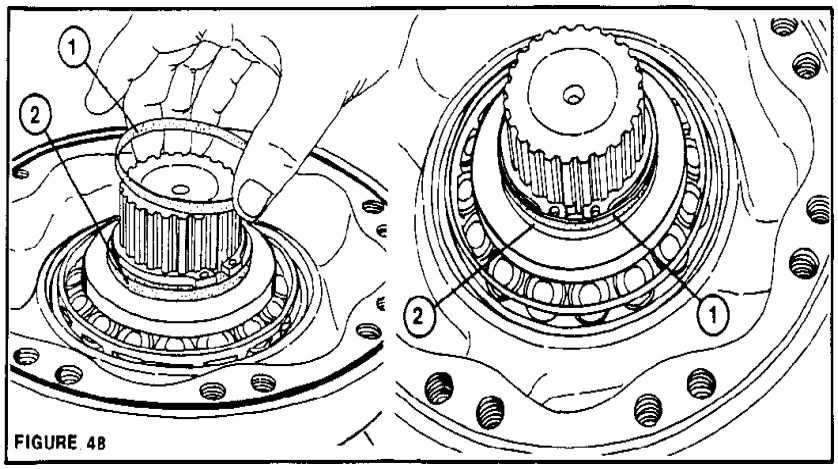


FIGURE 48

INSTALLATION OF CAM RING (O-RING) SEALS

A) Refer to figure 49.
Apply a small amount of petroleum jelly or grease at several locations in o-ring groove of bearing support housing (1), Install new o-ring seal into groove as shown. Lightly coat exposed surface of o-ring with clean hydraulic oil to promote proper sealing.

Apply a small amount of petroleum jelly or grease at several locations in o-ring groove of distribution over (2). Install new o-ring seal (3) into groove and lightly coat o-ring with clean hydraulic oil.

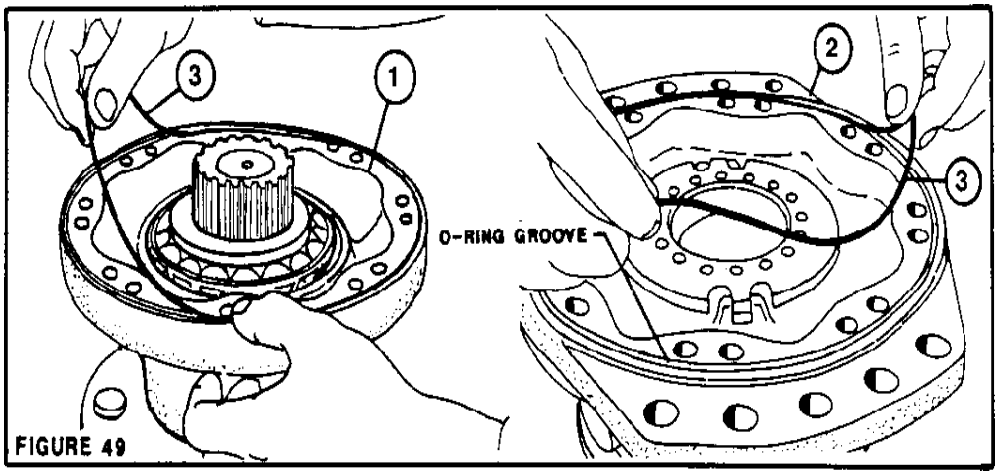


FIGURE 49

1.07 SERVICE PROCEDURES

SEALS AND BEARINGS (1.07-2)

REASSEMBLY

INSTALLATION OF CYLINDER BLOCK AND CAM RING

A) Refer to figures 50 and 51.
Check condition of cylinder block (1). Inspect piston rollers (2) and distributor mating surface (3) for nicks and scratches. Inspect splines (4) on cylinder block (1) and on wheel shaft for extreme wear or chips; replace parts as necessary. Install cylinder block onto wheel shaft splines with distribution holes (5) facing up. Cylinder block should easily slide into place. If any binding occurs, remove block and check for proper alignment or for nicks on wheel shaft or cylinder block splines.

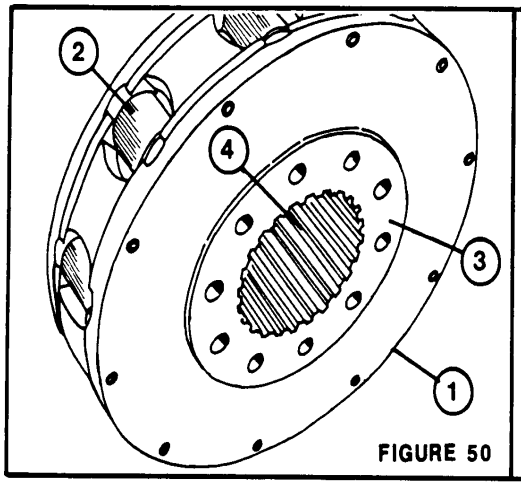


FIGURE 50

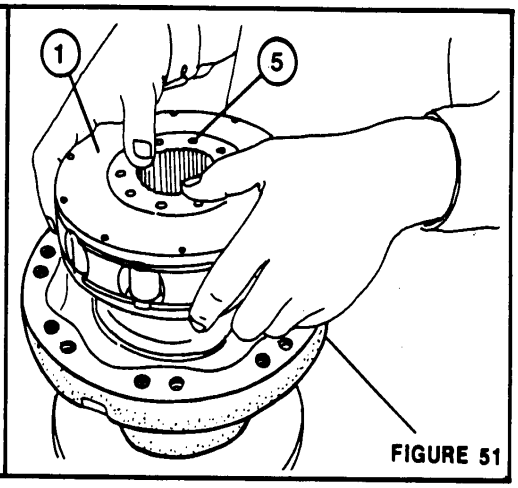


FIGURE 51

B) Refer to figures 52 and 53.
Check condition of cam ring (1) Inspect for nicks and scratches; replace if necessary. Carefully place cam ring on top of bearing support housing (2) and align holes. Coat entire top surface of cylinder block (3) with hydraulic oil.

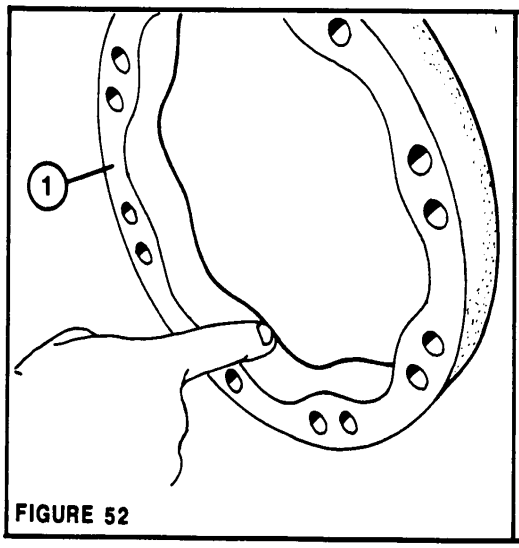


FIGURE 52

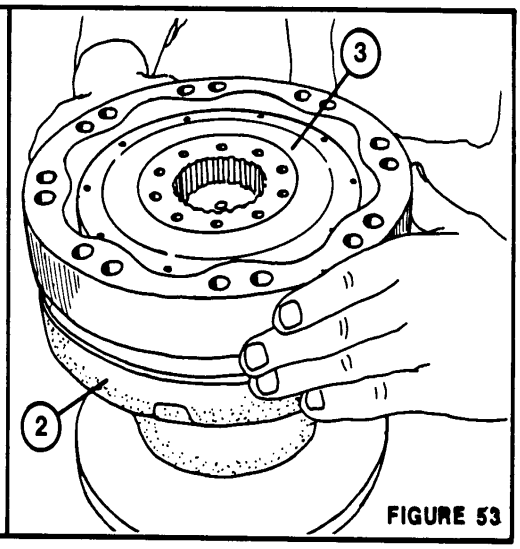


FIGURE 53

1.07 SERVICE PROCEDURES

SEALS AND BEARINGS

REASSEMBLY

INSTALLATION OF DISTRIBUTION COVER

A) Refer to figures 54 and 55.
Inspect cylinder block mating surface (1) of distributor (2), mounted in distribution cover (3) Check for nicks or scratches; replace distributor if necessary - refer to section 1.07-4. Before cover installation make sure o-ring seal (4) is properly seated and lightly coated with hydraulic oil. Check to ensure that location tabs (5) of distributor are correctly seated.
NOTE: 2-SPEED MOTORS HAVE TWO SETS OF TABS. REFER TO FIGURE 76B FOR PROPER ALIGNMENT.

B) Carefully set distribution cover (3) onto cam ring and align holes. Install original socket head bolts (6) to secure cover and cam ring to bearing support. Using a metric hex key or hex driver, alternately tighten bolts. Torque bolts to a value of 74 foot pounds (ft.lbs..) (222 ft. lbs. - MS11 motor).

C) Proceed to following page for inspection of accumulator and priming of motor before remounting onto machine.

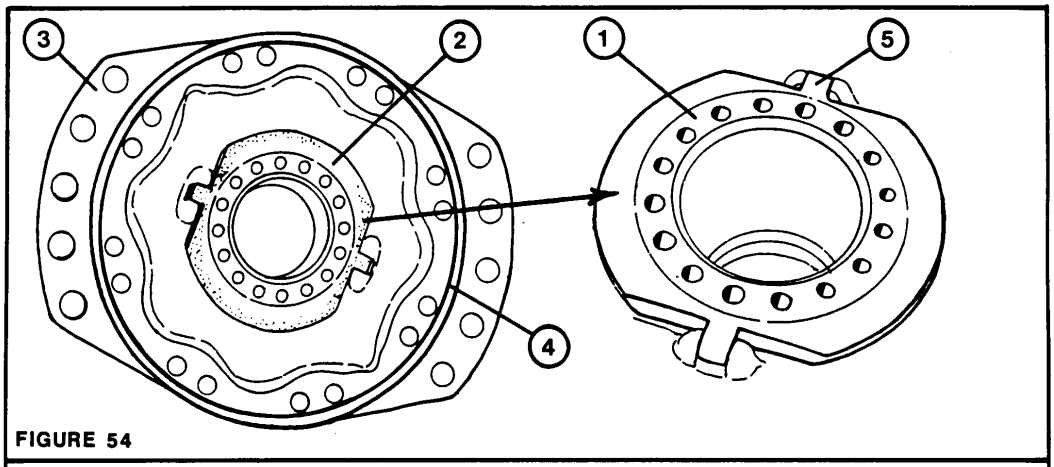


FIGURE 54

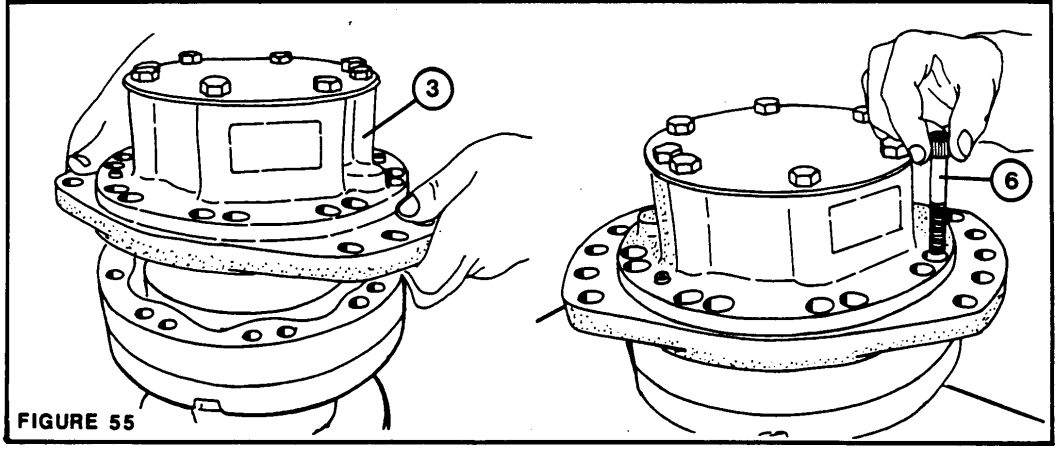


FIGURE 55

1.07 SERVICE PROCEDURES

SEALS AND BEARINGS

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1.07 SERVICE PROCEDURES

SEALS AND BEARINGS

PRIMING MOTOR

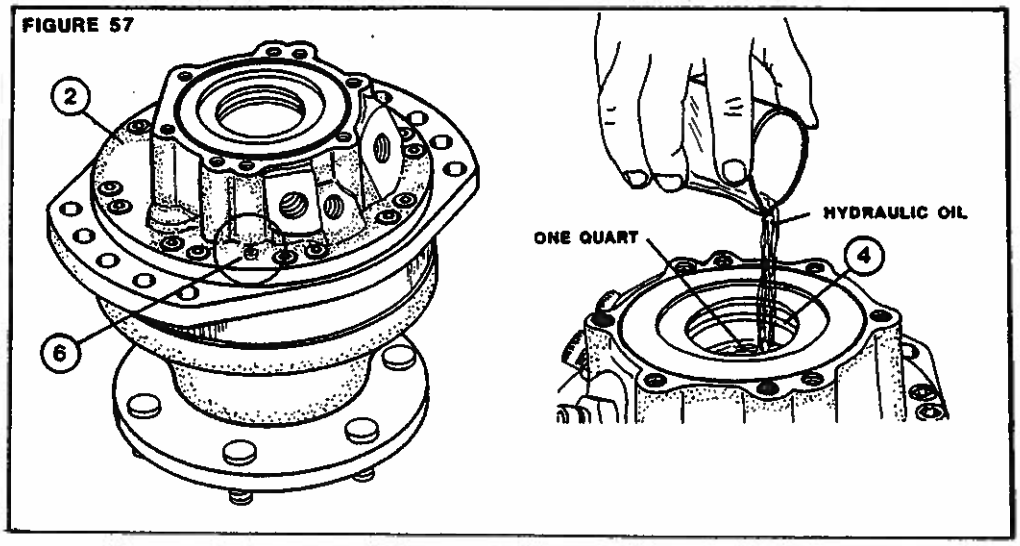
B) Refer to figure 57.
Remove one or both bleed screws (6) from distributor cover (2), using 7 millimeter (mm) (or larger) hex key. Fill motor through distributor cavity (4) with approximately one quart of fresh hydraulic oil or until oil flows out of bleed screw holes(s).

NOTE – Use hydraulic oil that meets or exceeds specification for hydrostatic system of machine.

C) Reinstall and tighten bleed screws(s). Lightly coat o-ring seal (5) with clean hydraulic oil and reinstall cover plate onto distributor cover. Torque cover plate bolts to 88 ft.lbs. (90 ft.lbs. – MS11 motor).

D) Proceed with section 1.08 for motor installation onto machine.

FIGURE 57



1.07 SERVICE PROCEDURES

CYLINDER BLOCK AND PISTON ASSEMBLIES (1.07-3)

DISASSEMBLY

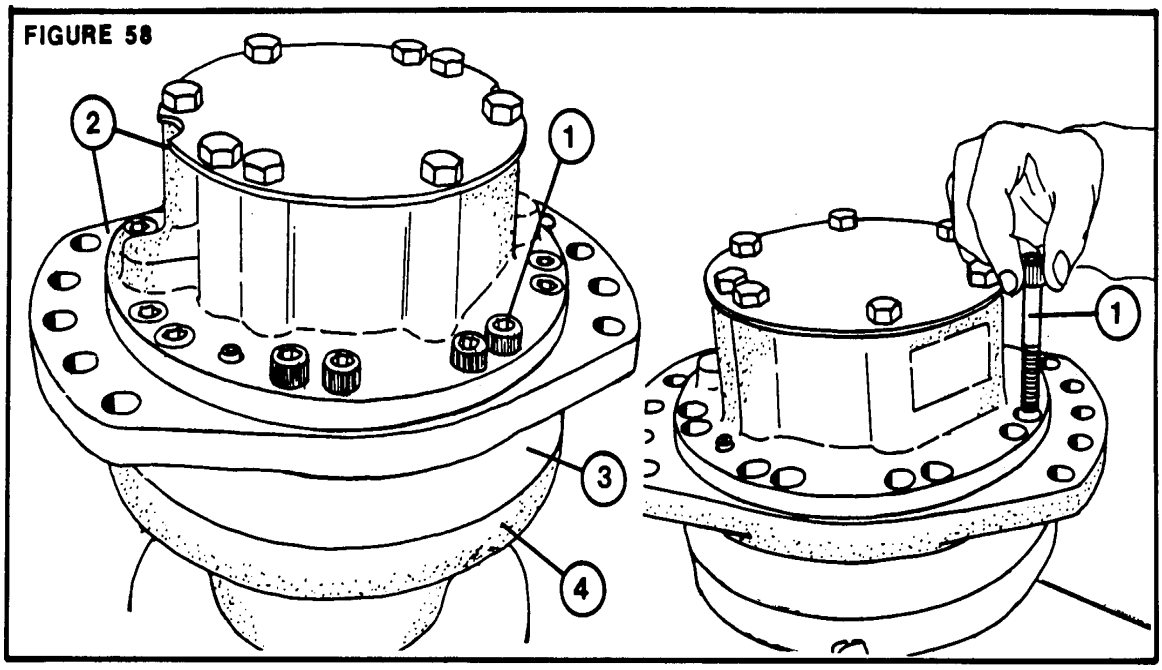
CYLINDER BLOCK REMOVAL

A) Remove wheel motor from machine. Refer to Section 1.06.

B) Refer to figure 58 and to illustrations on pages 61 and 62.
Remove 14 (of 16 total) (or 10 of 12 total -MS11 motor) socket head bolts (1) securing distribution cover (2) to cam ring (3) and bearing support housing (4) using 10 mm (or larger) hex key or hex driver. Leave two bolts partially engaged; turn motor horizontal and break open to drain oil.

Set motor into the tank of a parts washer with wheel studs down. Remove remaining bolts.

FIGURE 58



1.07 SERVICE PROCEDURES

CYLINDER BLOCK AND PISTON ASSEMBLIES

DISASSEMBLY

CYLINDER BLOCK REMOVAL

C) Refer to figures 59 and 60.
CAREFULLY lift distribution cover from cam ring.

NOTE - If cover is lifted straight up, distributor (1) will tend to adhere to cylinder block (2) because of oil film between mating surfaces. To insure that distributor remains seated in cover, lift cover one side only to break adhesion between distributor and cylinder block.
ALTERNATE METHOD: CAREFULLY insert thin piece of wood under location tab (3) of distributor and pry up to break adhesion

CAUTION - Inserting wood too far may scratch mating surfaces of distributor and/or cylinder block.

Remove cam ring (4) and discard large 0-ring seals on distribution cover and bearing support housing.

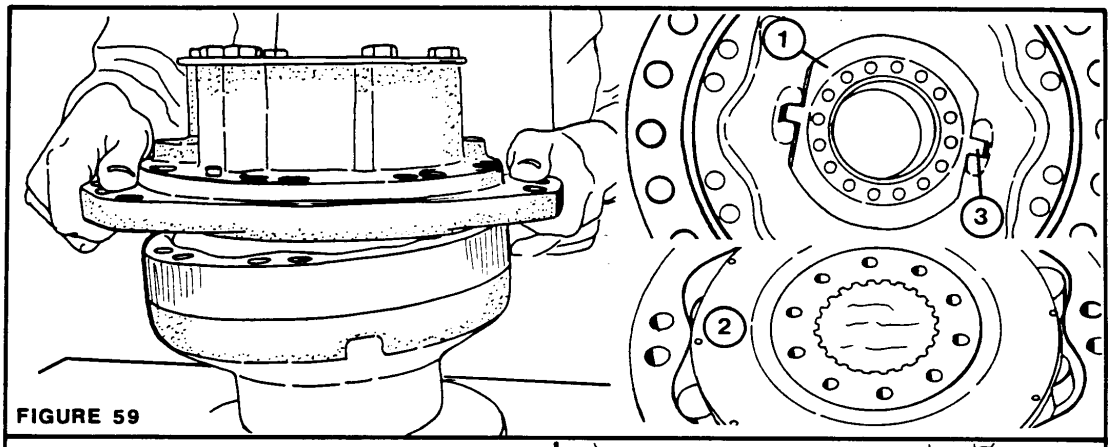


FIGURE 59

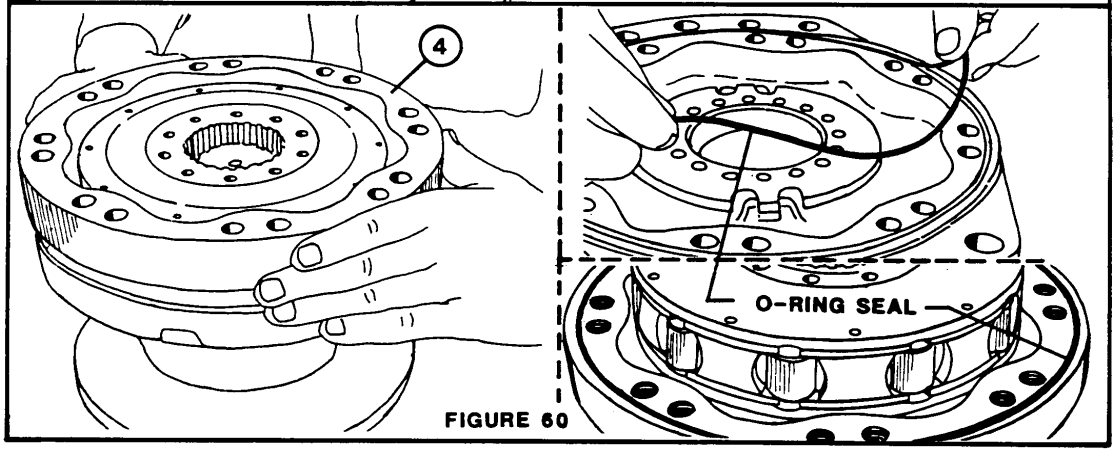


FIGURE 60

1.07-3 SERVICE PROCEDURES

CYLINDER BLOCK AND PISTON ASSEMBLIES (1.07-3)

DISASSEMBLY

CYLINDER BLOCK REMOVAL

D) Refer to figure 61.
CAREFULLY remove cylinder block assembly (1) from splined wheel shaft (2) by lifting straight up. If necessary, apply leverage under block on opposite sides at same time.

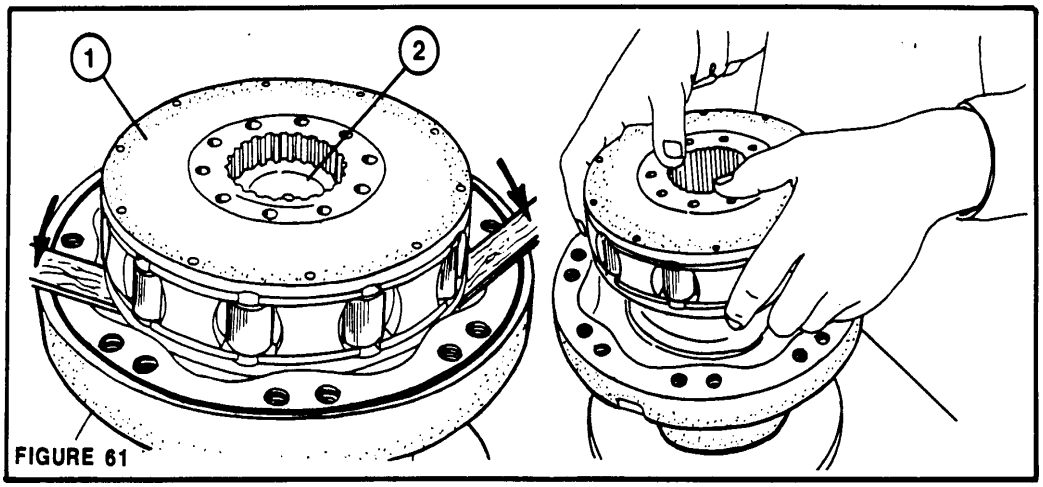
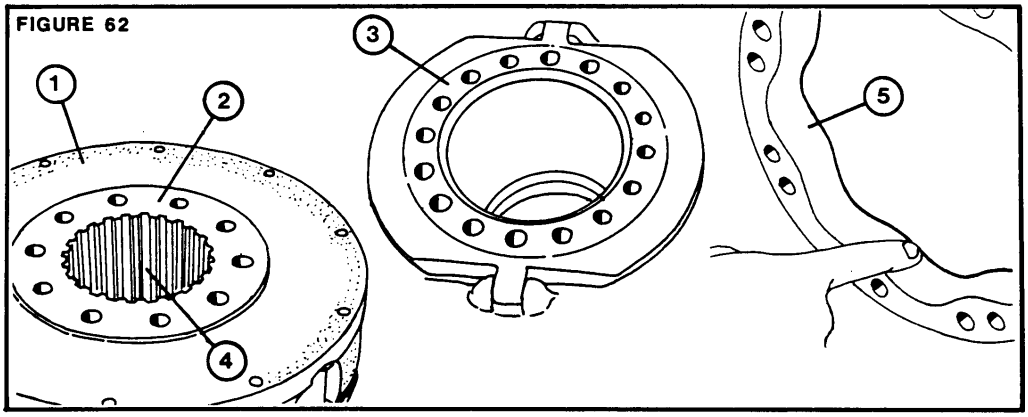


FIGURE 61

E) Refer to figure 62.
Check condition of cylinder block (1). Inspect distributor mating surface (2) of cylinder block and cylinder block mating surface (3) of distributor (valve block) for deep scratches, nicks or uneven wear.

Inspect splines (4) on cylinder block and on wheel shaft for extreme wear or chips. Check for uneven wear patterns on lobes of cam ring (5); possibly indicating problems with the pistons and/or rollers.

If cylinder block is damaged as described earlier, replace with new cylinder block assembly (including pistons and rollers); and if necessary, replace distributor.

FIGURE 62


1.07 SERVICE PROCEDURES

CYLINDER BLOCK AND PISTON ASSEMBLIES (1.07-3)

DISASSEMBLY

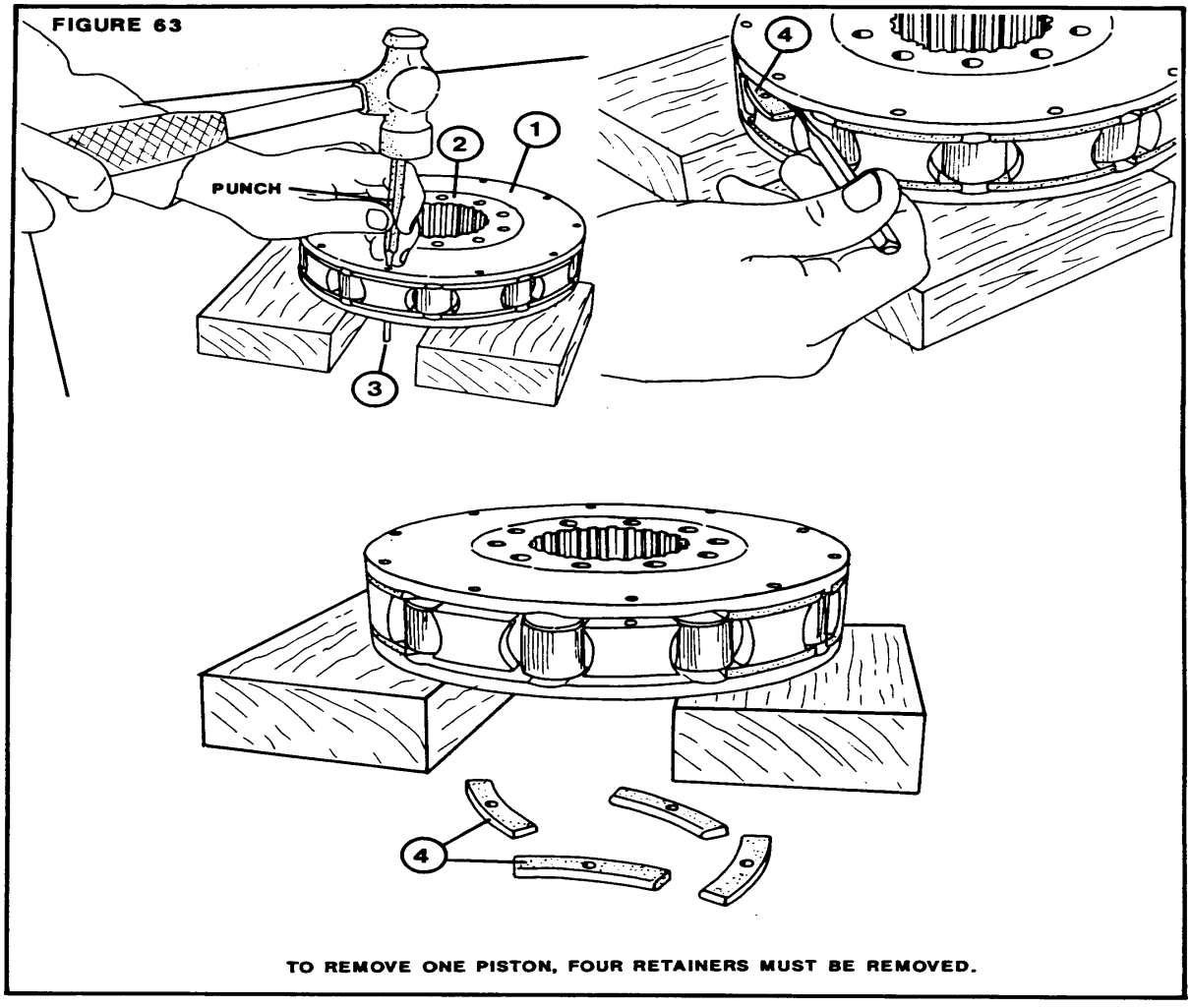
REMOVAL OF PISTON ASSEMBLIES

Your cylinder block will contain one of two different kinds of piston retainers. It will either have roll pins and retainers, as shown in Figure 63, or it will have clips and lunambules as shown in figure 63B on page 93. Follow the directions for your type of retainers for removal and installation of piston assemblies.

ROLL PIN AND RETAINER REMOVAL

A) Refer to figure 63.
Support cylinder block assembly (1) on two blocks of wood with distributor mating surface (2) face up.

Tap out each roll pin (3) using a punch and hammer. Remove piston/roller retainers (4).



1.07-3 SERVICE PROCEDURES

CYLINDER BLOCK AND PISTON ASSEMBLIES (1.07-3)

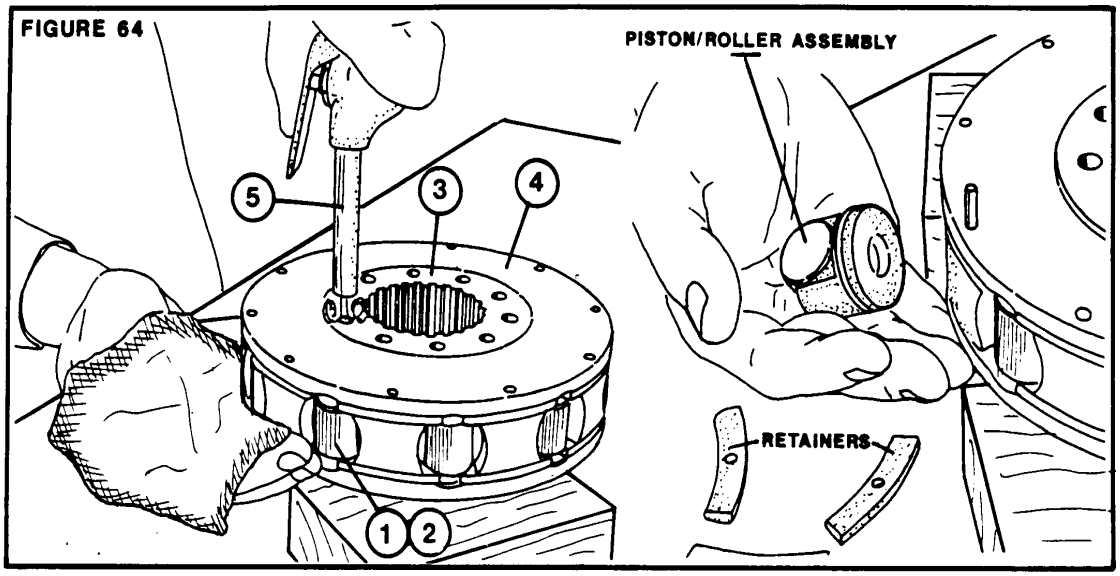
DISASSEMBLY

REMOVAL OF PISTON ASSEMBLIES

B) Refer to figure 64.
Using a LIGHT application of compressed air, CAREFULLY extract each piston (1) and roller (2); being careful NOT to scratch distributor mating surface (3) of cylinder block (4) with air nozzle (5). Catch pistons in hand covered with shop cloth.

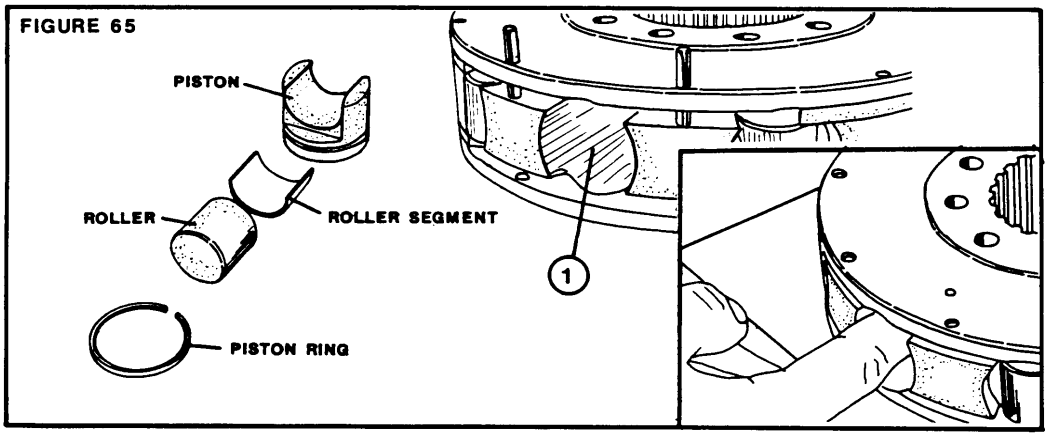
CAUTION - Pistons may eject from cylinder bore with considerable force unless a LIGHT application of compressed air is used.

FIGURE 64



C) Refer to figure 65.
Clean and inspect condition of pistons, rollers and cylinders bores (1) for any signs of seizure or abnormal wear. If serious wear is found, replace cylinder block assembly (including pistons and rollers).

FIGURE 65



1.07-3 SERVICE PROCEDURES

CYLINDER BLOCK AND PISTON ASSEMBLIES (1.07-3)

DISASSEMBLY

CLIP AND LUNAMBULE REMOVAL

A) Refer to figure 63B.
Carefully pry clips out of groove on cylinder block. If clip is bent during removal, it must be replaced. Using a LIGHT application of compressed air, CAREFULLY extract each piston and lunambule assembly.

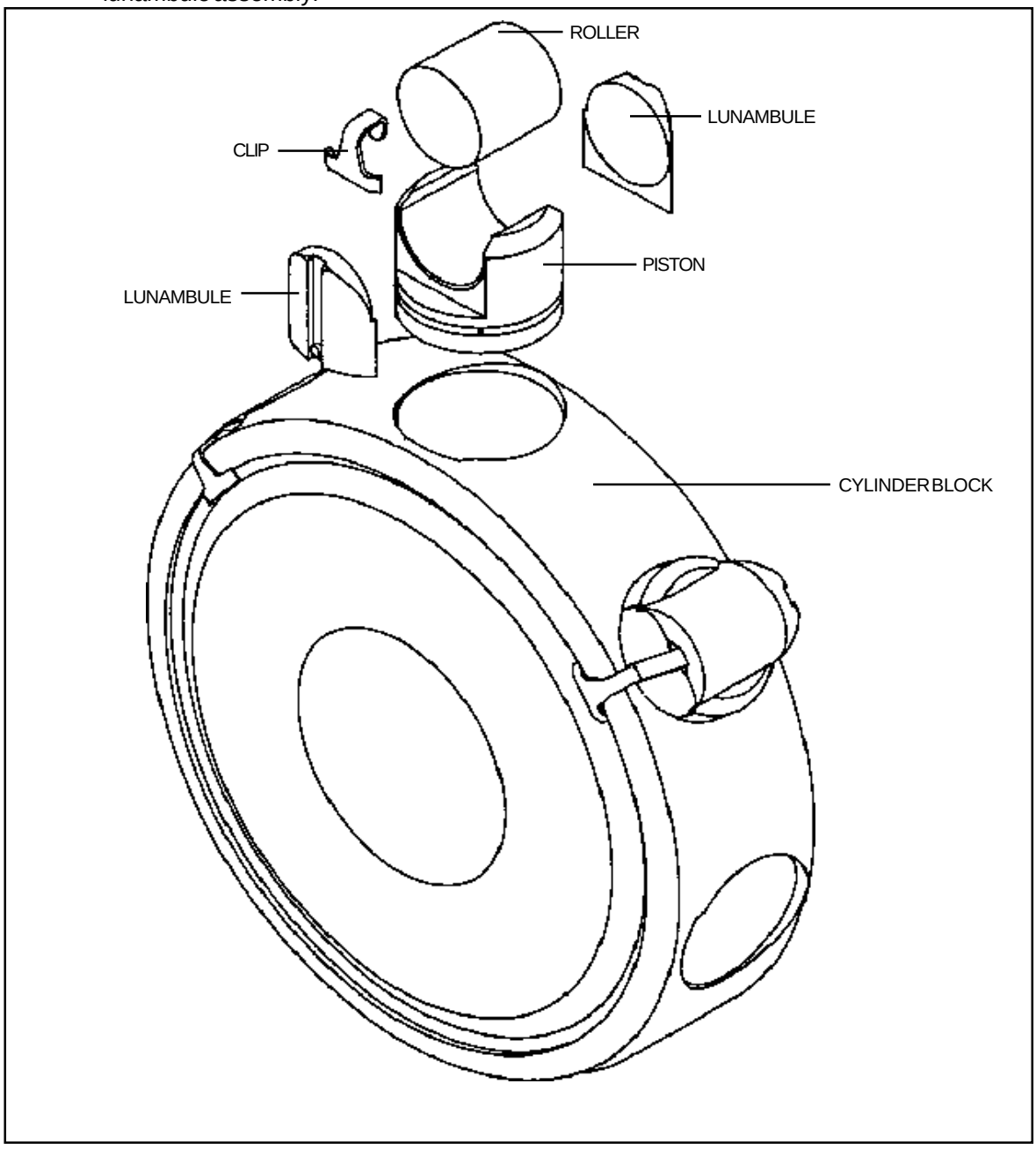


Figure 63B

1.07 SERVICE PROCEDURES

CYLINDER BLOCK AND PISTON ASSEMBLIES (1.07-3)

REASSEMBLY

INSTALLATION OF PISTON ASSEMBLIES

NOTE - Either one of two classes of pistons may have been installed originally: A class 1 piston (0.1 mm oversized is rare and is marked with a "1" on the piston head and its corresponding cylinder bore. Class 0 (zero) pistons and cylinder bores are standard and are NOT marked.

Make sure that proper repair kit is ordered when servicing piston assemblies. See page 91 for repair kit descriptions and kit part numbers for ordering purposes.

A) Refer to figure 66.
Coat new piston assembly (1) and cylinder bore (2) with hydraulic oil. Install each piston assembly into its bore by squeezing piston rings (3) with fingers while pushing piston assembly into bore.

NOTE - Pistons should move freely in cylinder block bores. If movement feels rough, examine pistons and bores for scoring or contamination. If scoring is excessive, replace with new (complete) cylinder block assembly (includes piston assemblies).

ROLL PIN AND RETAINER INSTALLATION

B) Refer to figure 67.
Reinstall piston/roller retainers (1) into grooves (2) of cylinder block (3). Align holes in guide segments with roll pin holes (4) in cylinder block. Using a punch and hammer, tap in new roll pins (5) into cylinder block to secure retainers.

NOTE - Roll pins should be tapped in BELOW the cylinder block surface an equal amount on both sides.

CLIP AND LUNAMBULE INSTALLATION

Slide lunambules onto pistons. Insert clips into grooves on lunambules and cylinder block as shown in Figure 63B on page 93.

C) Refer to section 1.07-2; "INSTALLATION OF CYLINDER BLOCK AND CAM RING" starting on page 84, and section 1.08-1 on page 106 for final wheel motor reassembly and reinstallation onto machine.

FIGURE 66

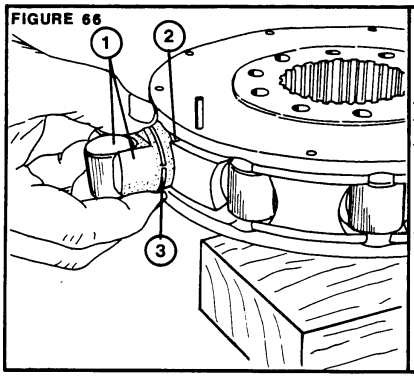
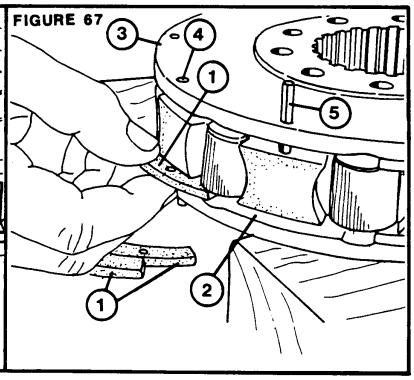


FIGURE 67



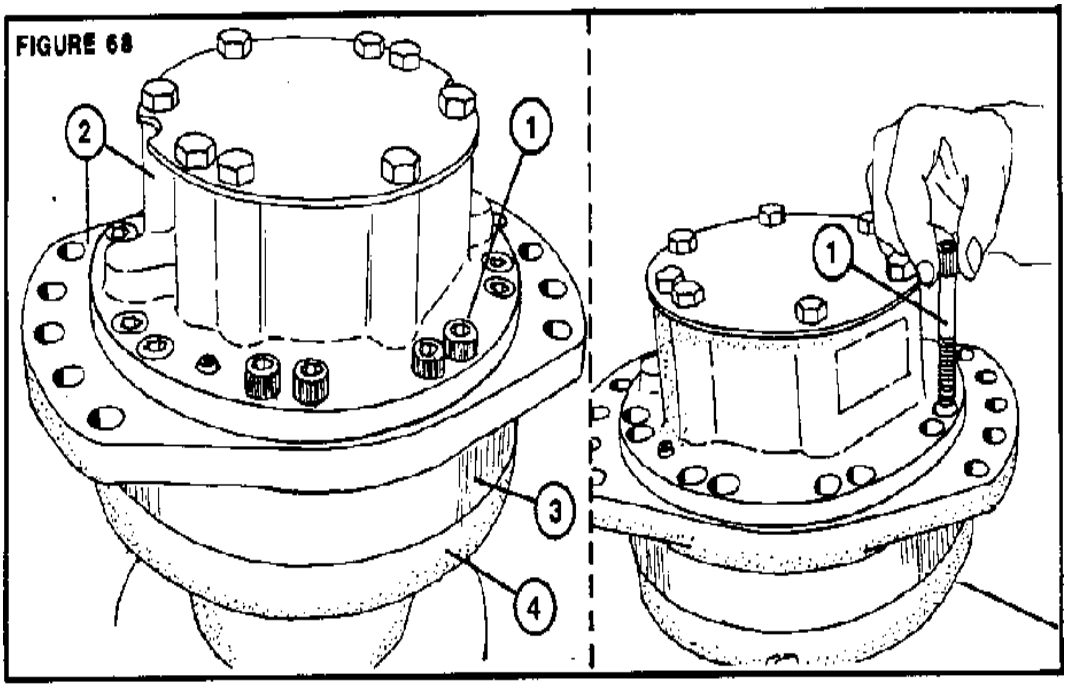
NOTES

1.07 SERVICE PROCEDURES

DISTRIBUTOR (VALVE BLOCK) AND DISTRIBUTION SEALS (1.07-4)

A) Remove wheel motor from machine; refer to section 1.06.

B) Refer to figure 68 and to illustrations on pages 61 and 62.
Remove 14 (of 16 total) (10 of 12 total -MS11 motor) socket head bolts (1) securing distribution (2) to cam ring (3) and bearing support housing (4) using 10 mm (or larger hex key or hex driver. Leave two opposite bolts partially engaged; turn motor horizontal and break open to drain oil. Set motor onto tank of parts washer with wheel studs down. Remove remaining bolts.



C) Refer to figures 69 and 70.
Carefully lift distribution cover from cam ring.

NOTE - If cover is lifted straight up, distributor (1) will tend to adhere to cylinder block (2) because of oil film between meeting surfaces. Lift cover on one side only to break adhesion. ALTERNATE METHOD: CAREFULLY insert thin piece of wood under location tab (3) of distributor and pry up to break adhesion.

CAUTION - Inserting wood too far may scratch mating surfaces of distributor and/or cylinder block.

Discard large o-ring seal in distribution cover.

1.07 SERVICE PROCEDURES

DISTRIBUTOR AND DISTRIBUTION SEALS (1.07-4)

DISASSEMBLY

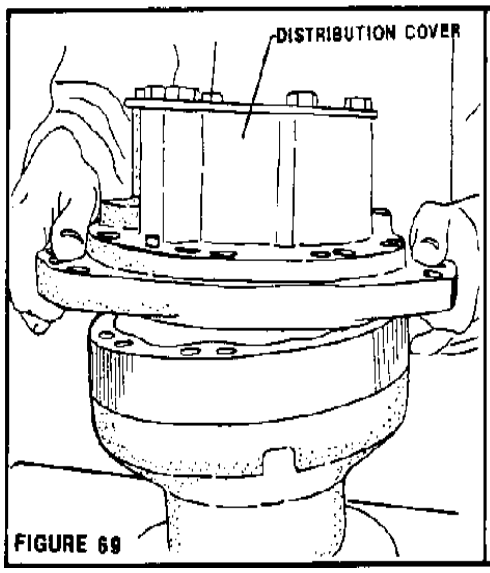


FIGURE 69

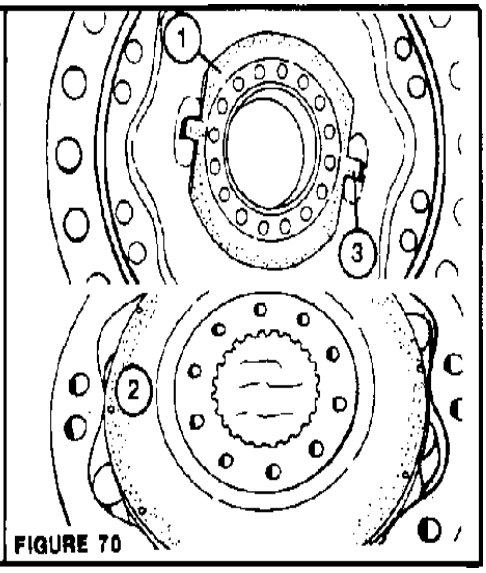


FIGURE 70

DISTRIBUTOR

D) Refer to figure 71.
Loosen distributor (1) in distribution cover (2) using open end wrench (es) to pry up on each side of the distributor (NOT at location tabs (3)). Turn distribution cover horizontal while holding distributor; then CAREFULLY remove distributor to avoid losing springs (4).

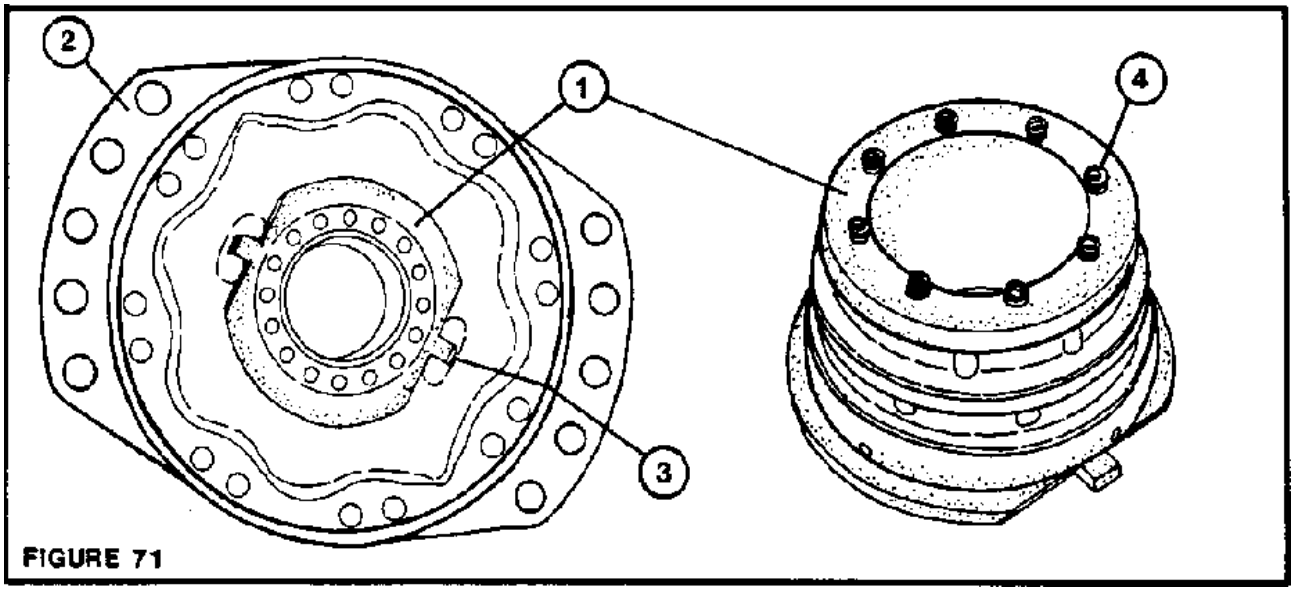


FIGURE 71

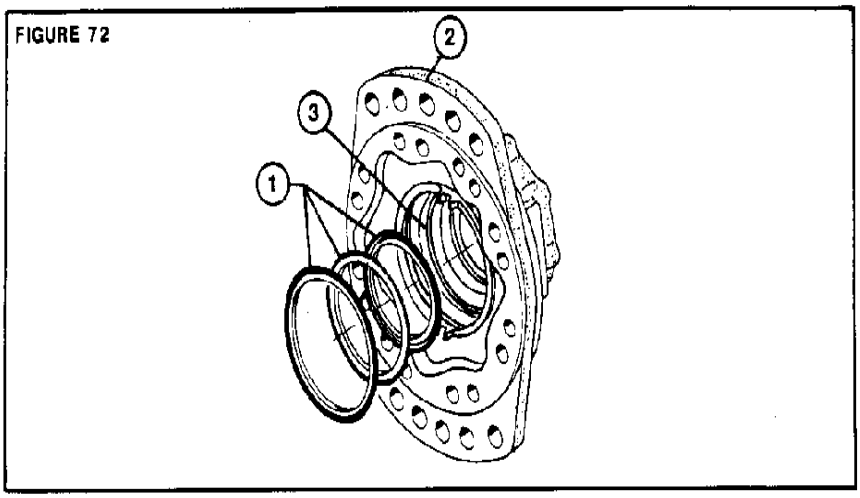
1.07 SERVICE PROCEDURES

DISTRIBUTOR AND DISTRIBUTION SEALS (1.07-4)

DISASSEMBLY

E) Refer to figure 72.
Using an o-ring pick or other sharp tool, remove and discard three o-ring and back-up seals (1) from distribution cover (2); making sure not to scratch or nick seal grooves (3).

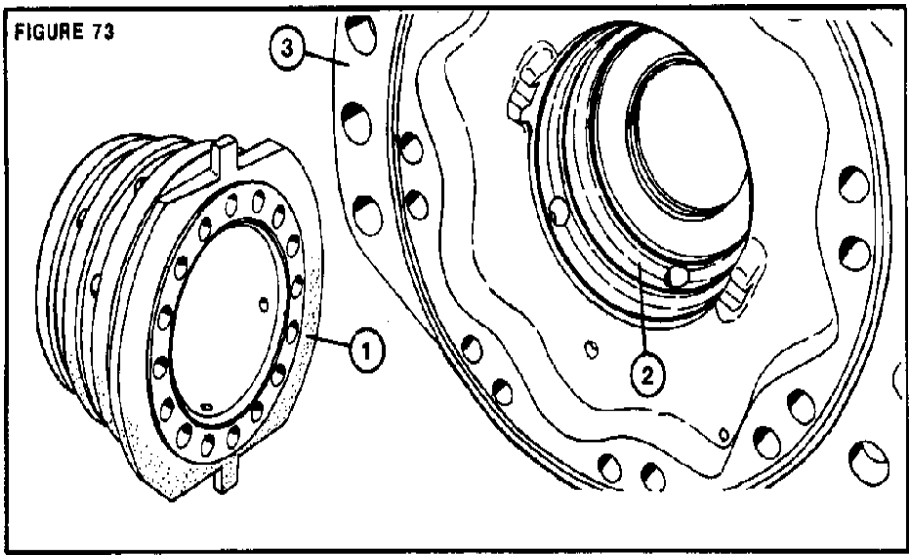
FIGURE 72



INSPECTION

F) Refer to figure 73.
Clean and inspect condition of distributor (1) and distributor cavity (2) within distribution cover (3). Check for any signs of seizure or abnormal wear. Replace parts if serious wear is found.

FIGURE 73



1.07 SERVICE PROCEDURES

DISTRIBUTOR AND DISTRIBUTION SEALS (1.07-4)

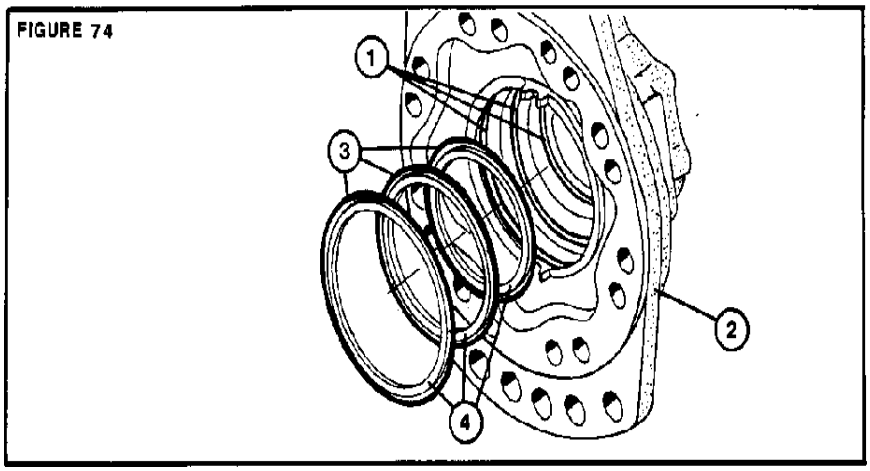
REASSEMBLY

DISTRIBUTION SEALS

A) Refer to figure 74.
Apply a light amount of grease or petroleum jelly to distributor seal grooves (1) in distribution cover (2).
First install o-ring seals (3) into grooves (1); then CAREFULLY install matching back-up (composite) seals (4) into grooves.

NOTE: Attempt to keep deformation of back-up seals to a minimum.
Apply grease or petroleum jelly over seals and inner surfaces of distributor cavity.

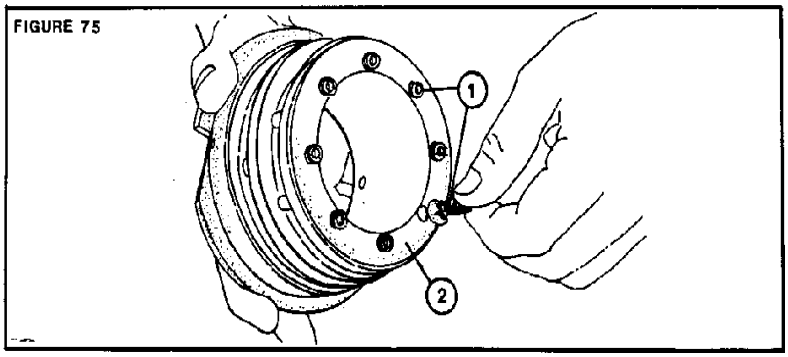
FIGURE 74



DISTRIBUTOR

B) Refer to figure 75.
Check to make sure that all springs (1) used in distributor (2) are all equal in height and are NOT damaged. Place springs in recesses after first applying grease to springs to hold them in place, for distributor reinstallation.

FIGURE 75



1.07 SERVICE PROCEDURES

DISTRIBUTOR AND DISTRIBUTION SEALS (1.07-4)

REASSEMBLY

DISTRIBUTOR

C) Refer to figure 76.
Apply a light coat of grease or petroleum jelly to seal bearing surfaces of distributor (1). Turn distribution cover (2) over on its side and CAREFULLY install distributor into cavity with location tabs (3) resting in tab ears (4).

NOTE - Make sure that springs do NOT fall out of distributor. Seat distributor into cavity by HAND ONLY and ensure that location tabs are correctly seated in tab ears.

NOTE - For 2-speed wheel motors there are two sets of tab ears for the distributor to seat into. One set of ears is for a right hand motor and the other set of ears is for the left hand motor. Refer to Figure 76B for proper alignment of the distributor. 2-Speed wheel motors have more pulling power in forward than reverse, so it is important to get the distributor installed correctly.

D) Refer to figure 77.
Apply a small amount of grease or petroleum jelly at several locations in large o-ring groove of distribution cover (1).
Install new o-ring seal into groove and lightly coat o-ring with clean hydraulic oil.

CAREFULLY set distribution cover onto cam ring (2) and align holes.
Install 16 or 12 original socket head bolts (3) to secure cover and cam ring to bearing support housing (4). Using a 10 mm (or larger) hex key or hex driver, alternately tighten bolts. Torque bolts to a value of 74 ft. lbs . (222 ft. lbs. - MS11 motor).

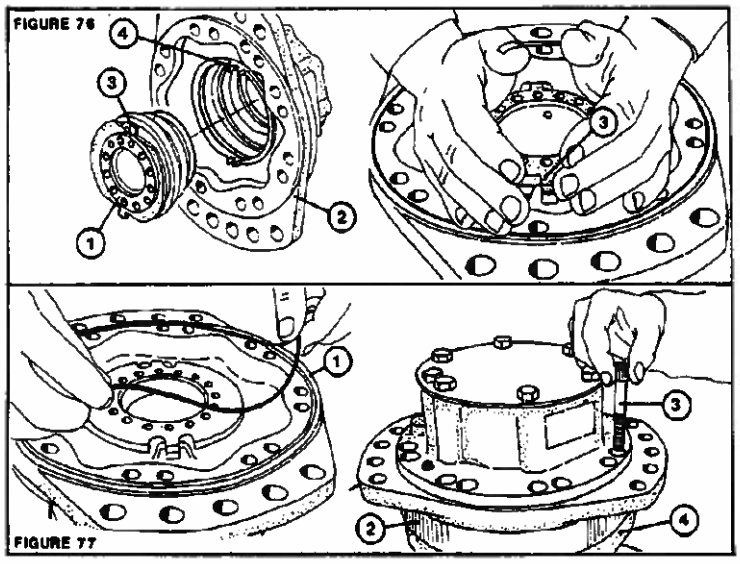


FIGURE 77

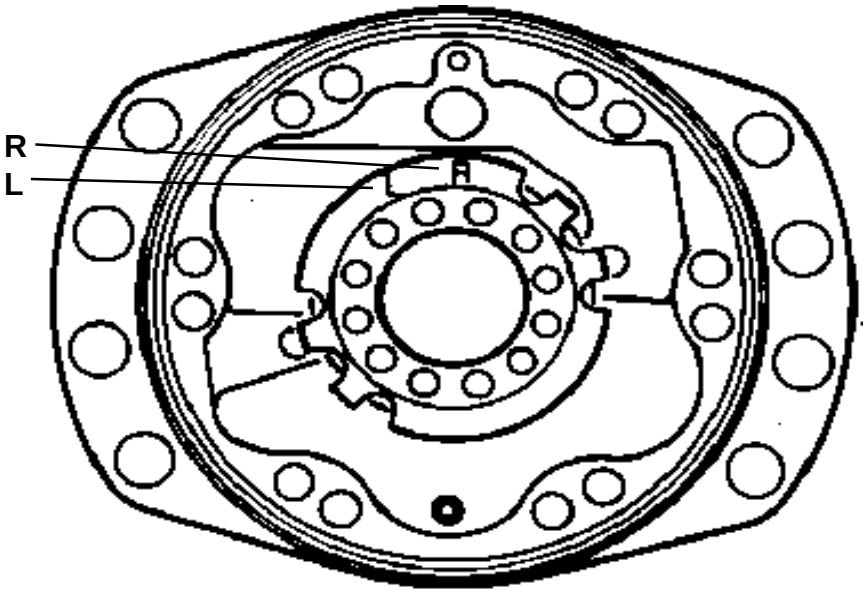
1.07 SERVICE PROCEDURES

DISTRIBUTOR AND DISTRIBUTION SEALS (1.07-4)

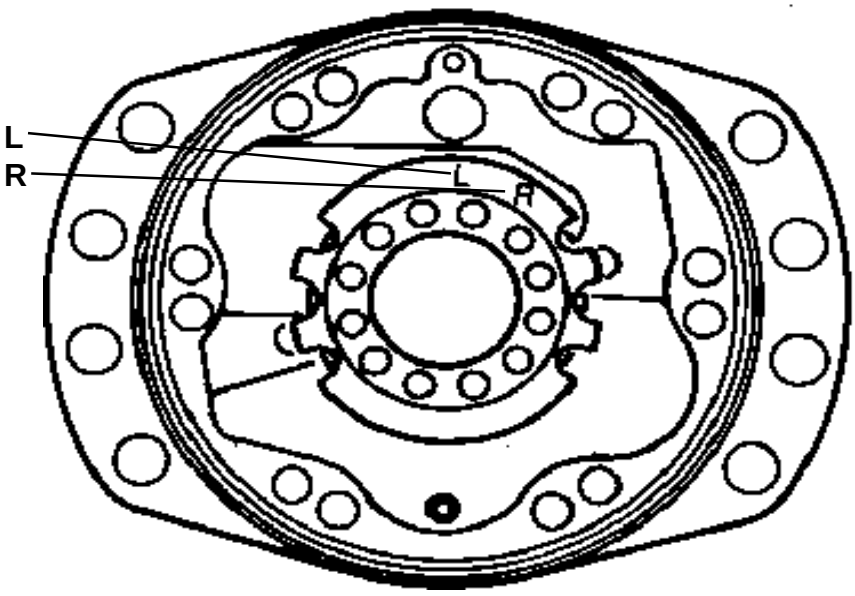
REASSEMBLY

DISTRIBUTOR

FIGURE 76B



RIGHT HAND MOTOR



LEFT HAND MOTOR

1.07 SERVICE PROCEDURES

THIS SHEET REPLACES PAGES 102, 103 AND 104 PER ECR F4067

1.07 SERVICE PROCEDURES

2 SPEED COMPONENTS (1.07-6)

A) Refer to figure 82A.
To inspect 2-speed components, remove the cover plate from end of the motor. Be CAREFUL the cover plate is spring loaded. Remove the snap ring from the end of the spool. Remove the washer, spring, spool and o-ring and inspect these for wear. Replace if necessary. Reinstall in the order shown. Reinstall coverplate, being CAREFUL not to crimp o-ring under the cover plate.

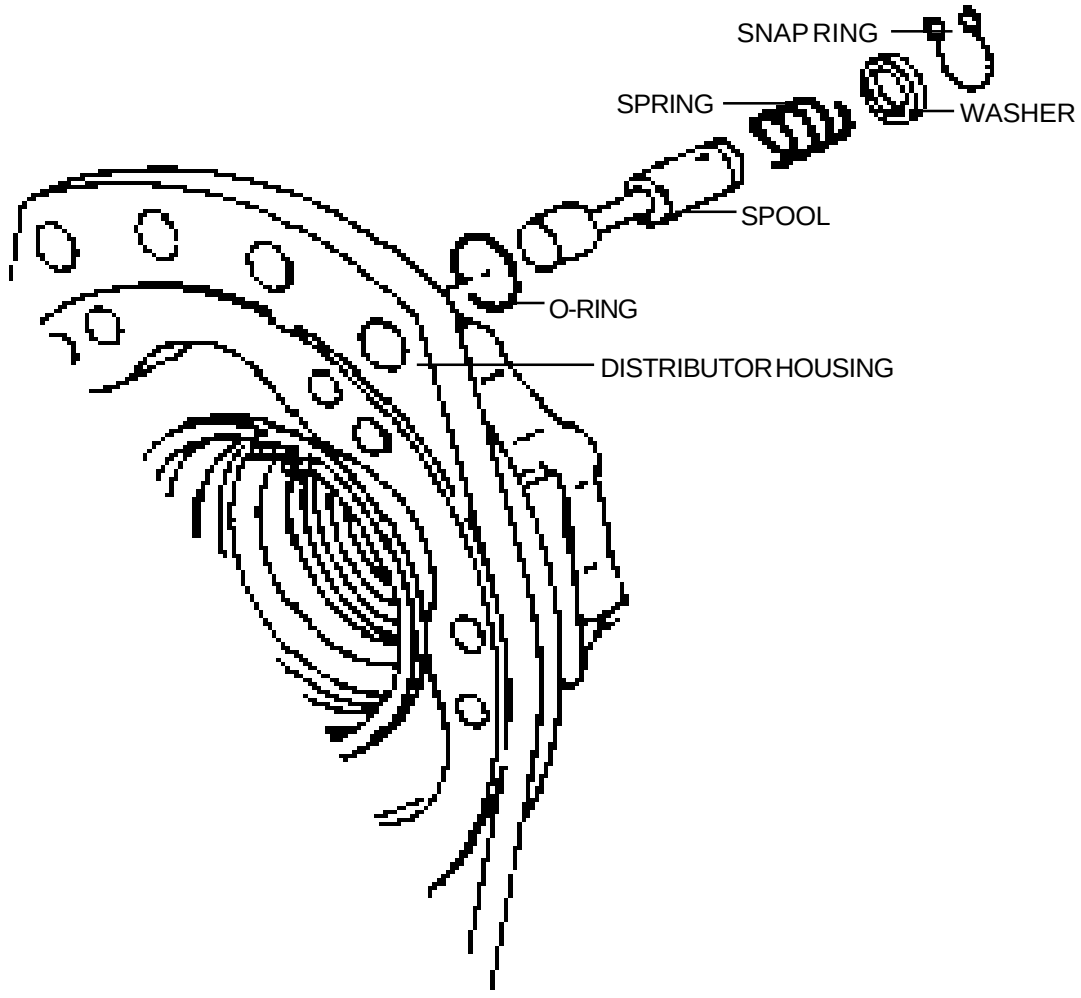


FIGURE 82A

1.08 MOTOR INSTALLATION ONTO MACHINE

REMOUNTING (1.08-1)

A) Refer to figure 83.
Attach wheel motor (1) to a suitable lifting device such as a shop crane (2). CAREFULLY move wheel motor close to mounting frame (3). Have a helper assist in positioning wheel motor on mounting frame.

CAUTION - The wheel motor is very heavy (127 lbs - MS08 & ME08; 185 lbs - MS11). Use extreme care when removing and handling motor to prevent personal injury and damage to wheel motor fittings.

Align holes and reinstall machinery bushings and mounting bolts. Apply Loctite No. 271 or equivalent to bolts. Remove lifting device. Torque bolts to 180-210 ft. lbs (300-350 ft. lbs. - MS11 motors).

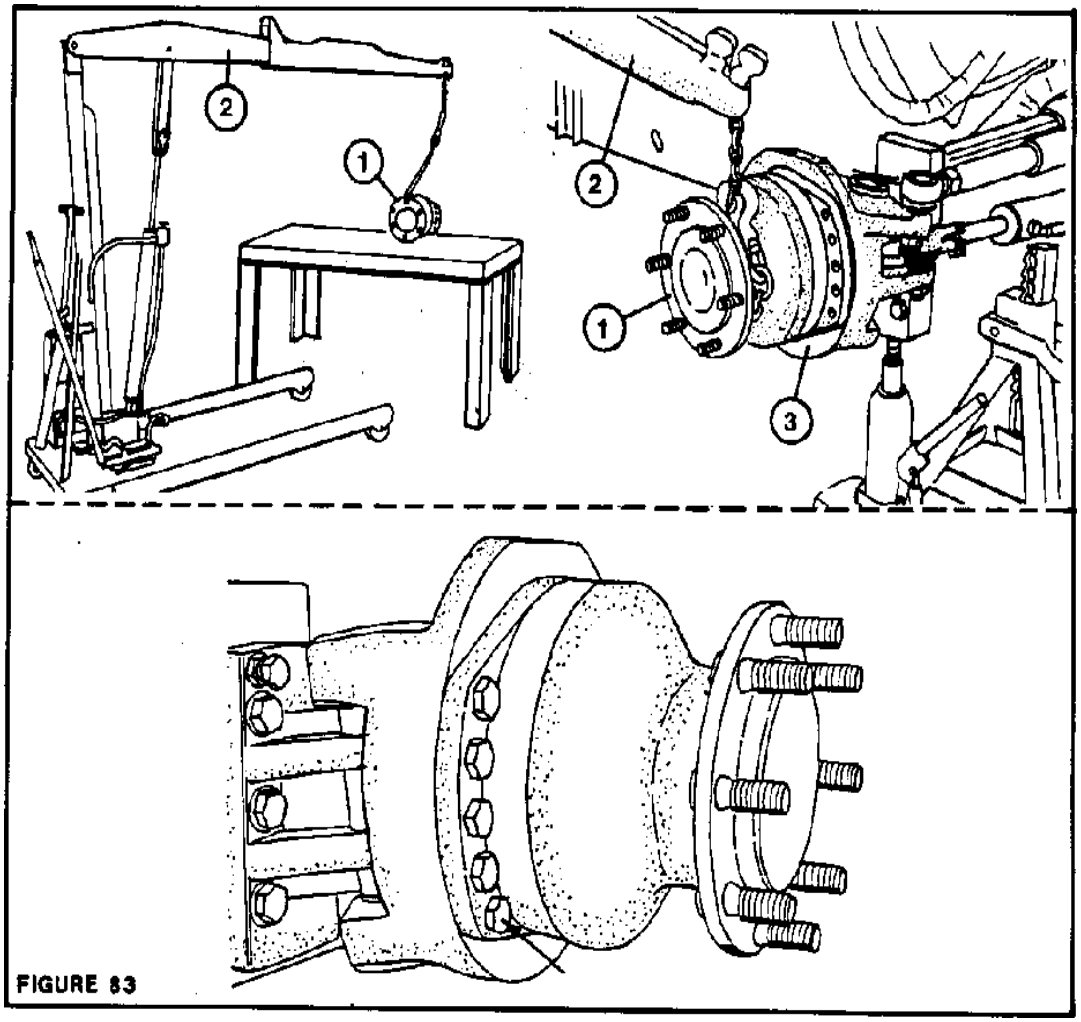


FIGURE 83

1.08 MOTOR INSTALLATION ONTO MACHINE

REMOUNTING (1.08-1)

B) Refer to figure 84.
Remove plugs from high pressure tubes (1) (with hoses already connected to tubes) and caps from wheel motor fittings (2). Reconnect tube nuts to wheel motor fittings, but do not tighten. Reposition tube clamp halves (3) on top of wheel motor mounting frame. Secure clamps and tubes to mounting frame using clamp plate (4), bolts (5) and lockwashers (6). Torque clamp bolts to 18-25 ft. lbs. and tube nuts (at fittings) to 35-40 ft. lbs.

C) Refer to figure 85.
Reconnect case drain hose (1) and motor case flushing system supply hose (2) (if equipped) to their original connection fittings. Tighten hose ends securely. Reinstall wheel/tire assembly and torque lug nuts to proper specification.

D) Proceed to Start-up Procedure found on page 109.

FIGURE 84

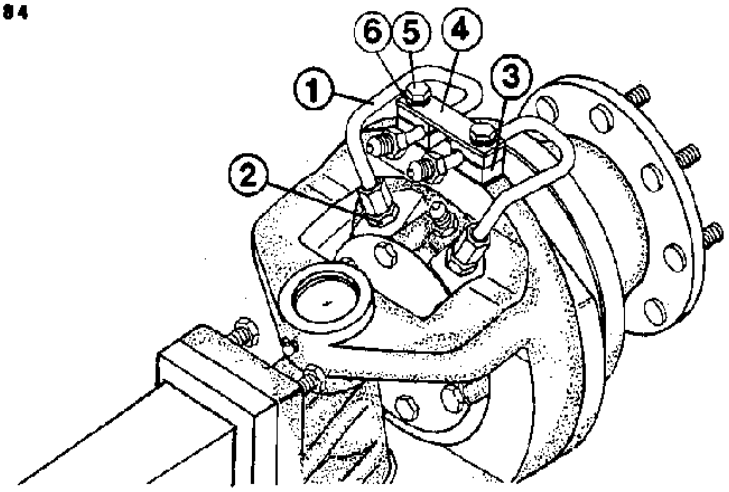
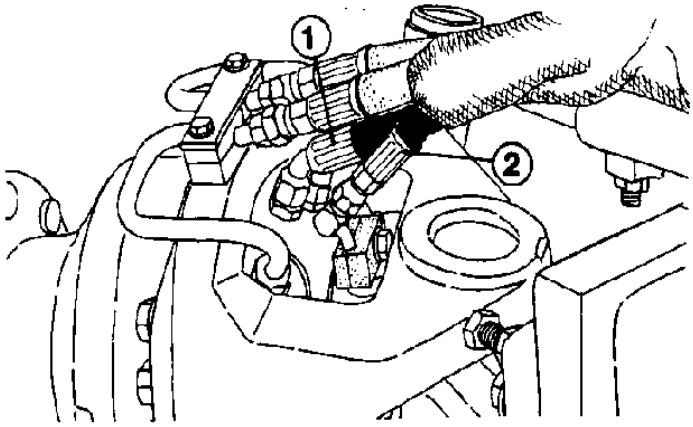


FIGURE 85



Turn wheel motor drives from stop to stop. Check that hoses do NOT kink, twist or bind. Make any necessary adjustments to clamps or fittings.

1.08 MOTOR INSTALLATION ONTO MACHINE

HOSE CONNECTIONS AT WHEEL DRIVES

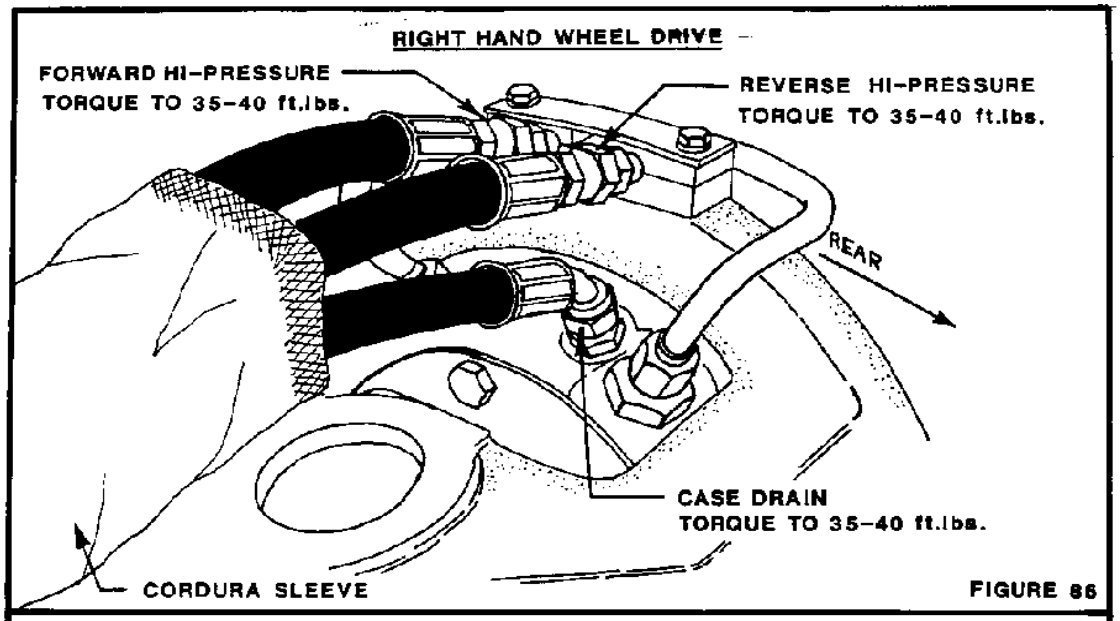


FIGURE 86

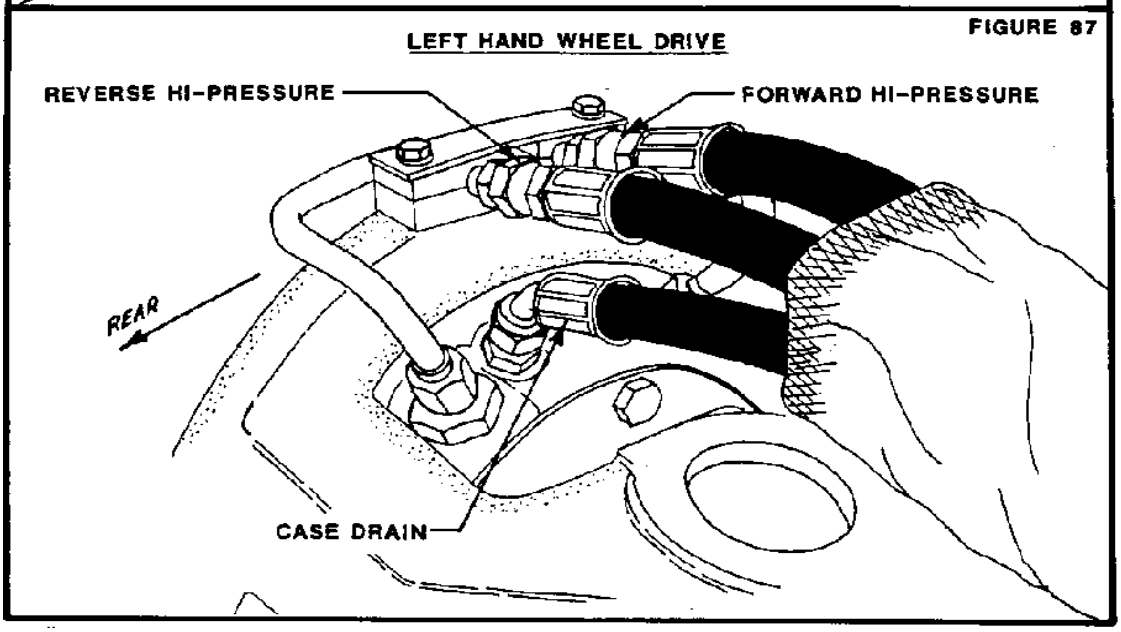


FIGURE 87

NOTE: - On *MUD HOG* kits with 2-speed motors, the right hand motor's forward and reverse ports are opposite the normal position (i.e. forward is to the rear and reverse is to the front). The left hand motor is as shown in Figure 87.

NOTE - If forward and reverse system pressure hoses are switched when reinstalled, motor will turn in the wrong direction.

START-UP PROCEDURE (1.08-2)

The following start-up procedure must be performed to insure adequate bleeding and flushing of the newly installed hydraulic components. This procedure also serves to check proper plumbing of the hydraulic circuit.

IT IS IMPORTANT THAT THESE INSTRUCTIONS BE CARRIED OUT AS SPECIFIED. Any alteration of this procedure will defeat its purpose, which is to bleed air out of the system and flush any possible contamination from the closed loop. Special attention must be given to the 1/2 inch limited movement of the hydrostatic control lever as it is critical not to allow excessive oil flow during this procedure. If at any time while performing this procedure a malfunction occurs that causes the hydrostatic system to be reopened, such as disconnecting a hose or fitting, it is necessary to begin the procedure again at STEP 1.

STEPS 1-7 of this procedure are performed with the front drive wheels of the machine on the ground and chocked securely; and the MUD HOG® equipped rear axle raised and secured such that the rear wheels remain off of the ground with sufficient clearance to rotate freely. STEPS 8 and 9 are performed with all wheels on the ground and sufficient operating clearance around the machine. At all times maintain proper fluid level in the hydrostatic reservoir.

STEP	ENGINE SPEED	GEAR SELECTOR	MUD HOG SWITCH	HYDRO LEVER	TIME	COMMENTS
1#	1/2 SPEED	NEUTRAL	ON	NEUTRAL	3 MIN	BLEED AIR ENTIRE SYSTEM
2	HIGH IDLE	NEUTRAL	OFF	1/2 INCH FORWARD	2 MIN	FLUSH FORWARD MAIN SYSTEM
3	HIGH IDLE	NEUTRAL	OFF	1/2 INCH REVERSE	2 MIN	FLUSH REVERSE MAIN SYSTEM
4#	HIGH IDLE	NEUTRAL	ON	1/2 INCH REVERSE	30 SEC MAXIMUM	CHECK CORRECT ROTATION OF MUD HOG *SEE NOTE
NOTE:A) If wheel(s) rotate reverse - go to STEP 6. B) If no rotation - go to STEP 5 (DO NOT repeat - check valve) C) If wrong rotation - correct forward/reverse circuit - to to STEP 1 D) If 2-speed motors - activate displacement control switch - check for change of speed of MUD HOG tires				# On Case 2555 Cotton Pickers, lockout switch must be activated to allow E-T II Valve to be on. This can be done by pushing the wire from the lockout switch toward 1st and 2nd gear.		
5*	LOW IDLE	HIGH GEAR HOLD BRAKES	ON	1/2 INCH REVERSE MAXIMUM	15 SEC MAXIMUM	CHECK CORRECT ROTATION OF MUD HOG *SEE NOTE
6*	HIGH IDLE	HIGH GEAR HOLD BRAKES	ON	1/2 INCH FORWARD	4 MIN	FLUSH FORWARD MUD HOG SYSTEM
7*	HIGH IDLE	HIGH GEAR HOLD BRAKES	ON	1/2 INCH REVERSE	4 MIN	FLUSH REVERSE MUD HOG SYSTEM
8*	1/2 SPEED	HIGH GEAR HOLD BRAKES	ON	1/4 INCH FORWARD	15 SEC MAXIMUM	FORWARD PRESSURE CHECK FOR LEAKS
9*	1/2 SPEED	HIGH GEAR HOLD BRAKES	ON	1/4 INCH REVERSE	15 SEC MAXIMUM	REVERSE PRESSURE CHECK FOR LEAKS

***** On Case Rice Combines with System III and Case 2555 Cotton Pickers, place gear selector in 2nd gear, as MUD HOG will not activate in 3rd.

1.09 ROUTINE MAINTENANCE/CARE

GENERAL RECOMMENDATIONS (1.09-1)

For any maintenance procedure be sure to maintain cleanliness of dissembled components.

In order to prevent hydraulic oil contamination within the wheel motors, it is IMPERATIVE that the oil filter elements (s) for the hydrostatic system of the machine be replaced on a REGULAR schedule, as indicated in the machine operation manual.

NOTE - The wheel motors are operated and lubricated by use of the hydraulic system oil from the machine.

The outboard bearing of each wheel motor is lubricated with grease in a sealed cavity. The inboard bearing is lubricated by hydraulic oil in the motor case; therefore, no maintenance is required for either bearing.

Periodically check for oil leaks. With machine shut off, check for evidence of external oil leakage around seals, housings, fittings or hose connections. Check for pinched hoses to wheel motors that could restrict oil flow and cause oil to overheat.

Check tightness of wheel motor mounting bolts in addition to fittings, and tube/hose connections.